

AN ABSTRACT OF THE THESIS OF

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Glen Dealy

Abraham Heschel wrote that a philosopher's primary task was not merely to describe and judge the modes and facts of actual human behavior, but also to examine and understand the meaning of those descriptions and judgements of modes and facts (Bella, 1978). Our values are critically tied to our structures of reasoning and to be sure are not the domain, only, of our philosophic community. While working on a Political Science internship for the Office of Technology Transfer at Oregon State University, in 1989, it occurred to me that little thought is given to the value dimension of researching, developing and transferring new technology into our public and private economic sectors. In evaluating the decisions to conduct research or to introduce into our public services and private commercial businesses, new technologies, the values underlying those technologies and their particular application must become essential criteria of any proposed economic or other justification scheme. This thesis will examine this observation and its ramifications in a business organizational, social, political and public administrative and philosophic context then offer some recommendations and draw some conclusions.

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A View Toward Reassessment

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## The Value Of New Technology: A View Toward Reassessment

"Our inventions are want to be pretty toys which distract our attentions from serious things. They are but improved means to an unimproved end."

Henry David Thoreau  
Walden Pond

### TECHNOLOGY: ITS ROLE AND IMPLICATIONS

#### GENERAL:

A fundamental fact about our present concept of modern history is that it has arisen out of the unique development of the natural sciences during the sixteenth and seventeenth centuries in Europe (Arendt, 1968). This unique development can generally be referred to as the 'Industrial Revolution' and connotes the harnessing of new technologies during this period for socio-political and especially economic ends. It is a relevant fact that the issue of which development (i.e. natural science or the actual technological applications themselves) came first can be debated (Collins, 1986). However, since the formalization of the scientific method (see Popper, 1950), it cannot be denied that technological innovations, whether based on pure or applied research, have been justified for, uniquely, anthropocentric reasons.

**TECHNOLOGY AS RATIONAL ACTION:**

Central to the notion of technological innovation as progress has been the notion of men as rational actors capable, as it were, of making objective choices. This objectivity, by the time of the Industrial Revolution, had rejected the idea of accepting, as reliable, knowledge gained by observation of naturally occurring events. It had accepted, instead, the reliability of knowledge gained from the observation of controlled experiments. Since the seventeenth century, the chief preoccupation of all natural and historical scientific inquiry has been directed toward the research and development of processes, particularly man-made processes (Arendt, 1958).

**ACTION AS CHOICE OR NECESSITY:**

From these inquiries new man-made technological processes have been introduced and implemented such as mechanical, solar and nuclear power and genetically engineered viruses and vaccines. Many of these newly engineered processes have begun to take on a life of their own in a fundamentally different manner than occurred with the introduction of mechanical technologies during the Industrial Revolution. These new processes can most precisely be described as man acting into the world (Arendt, 1968).

These actions as modes and facts of human activities, in principle, "...consist of an endless new chain of new

happenings whose eventual outcome (we as) the actors are utterly incapable of knowing or controlling beforehand" (Arendt, 1968). Their implications are that we have introduced increased unpredictability and uncertainty into that realm of our existence (the cosmos) previously thought to be ruled by inexorable laws of nature or the universe.

The distinction between technological progress and technological chaos has been obscured by unclear thinking and/or evaluation with regard to our inventions. This has centered around confusion about the meaning of our understanding and description of the modes and facts of 'technological innovations'.

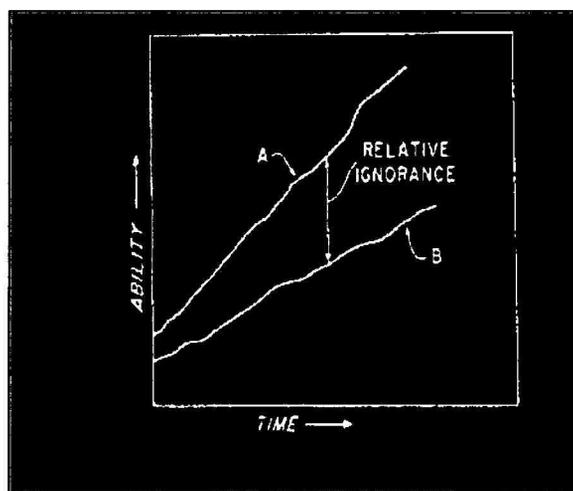
#### **THE TECHNOLOGICAL CHALLENGE:**

This can be illustrated by the comments of Drexler, who makes the point that powerful and new technologies pose basic threats to people and life; they create problems which we cannot hope to be able to completely foresee. Our very existence, he then implies, may very well depend on our ability (and soon) to learn how to safely conceive and introduce these new technologies (Drexler, 1986). Most importantly, it has been pointed out that these innovations appear to be having an increased impact on all aspects of our individual and collective lives. This impact can be seen in terms of political, legal, economic, social and cultural activity directed specifically at coping with the new

technology rather than the opposite, that of adapting the technology to enhance or eradicate our individual and social conditions (Borgmann, 1987).

#### **THE TECHNOLOGY DILEMMA:**

In its greater environmental and social context the technological challenge can be reflectively stated as the necessity to "...fulfill the responsibilities of each generation as trustee of the environment for succeeding generations" (National Environmental Policy Act, 1969). The



**Figure 1: The Technology Dilemma**

Source: Bella, Environment, Technology and Future Generation, 1977, p.4.

predicament behind this necessity is that technology, by its very nature, can and does change our social, political and environmental conditions at a very rapid rate. This rate far exceeds our ability to foresee the consequences of our technological actions. As figure 1 previously depicted, this divergence causes increased relative ignorance of ends. It is this ignorance that presents a real risk for our very existence (Bella, 1977).

It should be noted that the risk posed by this dilemma is increasing over time (Bella, 1977). Additionally, this dilemma is exacerbated by strong social pressure to avoid examination of consequences that tend to embarrass or conflict with powerful interests (both private and public) or established world views that promote the creation of these technologies (Watt, 1977). My hypothesis is that our risk is increasing precisely because our reasons for research and development and our methodologies for the evaluation of the application of new technologies lack meaningful consideration of the vital normative values which underlie them.

#### **TECHNOLOGY OUT-OF-CONTROL:**

Bella and King make the point that technology, once embarked upon, can get "out-of-control" in at least three important ways, not all of which fit the model of men as rational actors (King and Bella, 1992). These include the

intentional use of technology by private interests to the detriment of public interest (i.e. computer viruses, mass communication of personal data, and weapons of mass destruction, etc.); the unintentional failure of technologies that are too complex in their design and too tightly coupled by component parts to predict or prevent major systematic catastrophes (i.e. the Three Mile Island nuclear disaster, the Korean Airliner disaster, and Cherynoby1, etc.); and technologies that become self-legitimizing (i.e. the tools of measurement, knowledge and organization that make up a technology [new man-made natural process] filter out its meaning in any other context) (Bella, 1977; Perrow, 1984; Winner, 1977).

#### **TECHNOLOGY AS A VALUED RATIONAL CHOICE:**

It is precisely this potential for technological ignorance and chaos that should dictate a close examination not only of technologies that are under consideration for research and development (R&D) but also those being evaluated and proposed for public or private application. New technology transfer and introduction decisions, to be rational, must critically examine the extent to which these technologies, as real or perceived progress, have meaning as the product of a value driven evaluation and decision making process rather than as the product of the most instrumentally valuable economic means to an end.

Systems analysis and evaluation that have determined these technologies as only instrumentally valuable are inherently biased to produce a greater potential for technological chaos. Analysis and evaluation of technology that have additionally been reduced to simple profit and loss assessment are equally risky. To be safe, in the context of the continued existence of humankind, new technology research, transfers and introductions must not drive socio-political and other values but rather be value driven. Current cost-benefits analysis schemes, as they are now implemented, are wholly deficient in achieving this necessary "practical imperative" (see Kant, ed in Monson, 1963).

#### **'HOMOS ECONOMOUS' AND DISASTER-PRONE TECHNOLOGIES:**

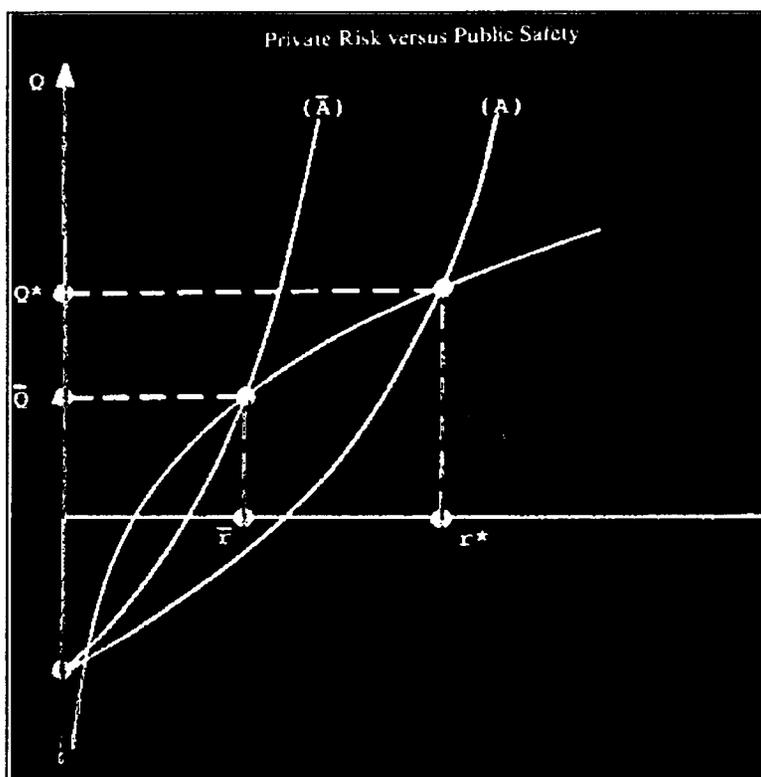
A host of economists make the point clear that profit maximization for individual business entities is enhanced by deviation from mature market conditions. To be more economically precise, these authors are saying that when the market place is in equilibrium (e.g. as it should always be in classical theory when true laissez-faire capitalism is operational) firms with identical extant opportunities will tend to choose different technologies to differentiate themselves (i.e. find a unique market niche) (DeMeza, 1987; England, 1988).

The implication of this analysis, in regard to choosing safe technologies, is that not only is the technology itself

a source of potential catastrophe, but the manner in which the technology is managed is equally dangerous. This is because business and public administrative management is, predominantly, instrumentally justified with respect to the efficiency of implementing the technology with acceptable risk to the firm or service rather than normatively valued with respect to implementing it with acceptable risk to humankind.

Figure 2 depicts this situation for business entities. Simply translated it shows that not only are firms naturally inclined to introduce technologies as a means of maximizing profits through differentiation (DeMeza, 1987), but they also are naturally inclined to do so in a manner clearly more risky to society than to themselves based on purely instrumental values related to free market economics. They are cost effective but none-the-less disaster-prone for society.

As figure 2 on the next page depicts, when the privately determined discount costs of a potential technological accident ( $A$ ) exceeds the socially determined discount costs of that same potential accident ( $\bar{A}$ ), then the firm's output rate ( $Q^*$ ) and its disaster risk ( $r^*$ ) will exceed the socially optimal output rate ( $Q$ ) and socially acceptable disaster risk ( $r$ ) (England, 1988).



**Figure 2: Disaster-Prone Technology**

Source:  
England, Kiklos, volume 41, 1988, p.388.

#### **TECHNOLOGY A REPRISÉ:**

A major problem in accepting the implications of these economic and other truths relating to our judgements about the facts and modes of human behavior, is that "...our scholars have repeatedly rejected, in principle, the possibility that the form or content of scientific knowledge, as distinct from its incidence or receptions, might be in some way socially contingent...". Instead they insist that "... the substance of scientific knowledge is independent of

social influence and have, in fact, tried to justify this position on philosophical (i.e. Philosophy of Science) grounds " (Rifkin, 1983).

To the extent that our inventions are left untied to humankind, subsumed in science and its concomitant management and other methodologies which look only at the instrumental value of these inventions as desired means to other than humankind-valued ends, technology will continue to pose its dilemma. The recognition, philosophically, that science is itself only one mode of understanding is central to its use for humankind or its use of humankind. This same premise is true of capitalism in our economic and social lives and representative democracy in our political and public administrative ones too.

Technology either serves the public good or it does not. Anytime a technology is considered for research, development or application it should be evaluated with that good in mind or it runs a greater risk of not serving humankind. Instrumentally valuing technology as a means while creating profitable extant opportunities for capitalist firms is inherently dangerous to humankind. Instrumentally valuing the end to which a technology is directed is equally a perilous proposition for humankind.

In this thesis a discussion of valuing and an overview of the various modes and facts surrounding the valuing of technology in organizational, social, philosophical,

political and public administrative settings will be presented. The key implications of these modes and facts for humanly valuing technology will be offered. An objective will be to present an understanding of the meaning of these modes and facts as they pertain to how to humanly value technology. Finally, a summary of current justification techniques will be presented, a critique offered, and some improvements recommended to address some of the understandings presented throughout each section of the thesis and to further address what this author believes to be other shortcomings of these techniques.

"...Remembrance, which is only one, though one of the most important, modes of thought, is helpless outside a pre-established framework of reference, and the human mind is only on the rarest of occasions capable of retaining something which is altogether unconnected. ...Action that has meaning for the living has value only for the dead, completion only in the minds that inherit and question it."

Hannah Arendt  
Between Past and Future

#### DEFINING VALUE: A NORMATIVE OR INSTRUMENTAL CHOICE

##### GENERAL:

Underlying all 'technological fixes' is a vast array of modes and facts that allow us to describe and judge our innovations. As has been previously suggested, it is the meaning of these descriptions and judgments that is central to the act of introducing new technologies into the world. Conveying our meaning, to be remembered by mankind, demands the communication and embodiment, in our inventions, of the values that comprise our existence. Otherwise these values have no longevity beyond our physical existence and no remembrance, in spite of any new man-made natural processes (artifices) that we may have created. They become artifices, in fact, that often evolve in their own course and evoke

further 'technological fixes' by those who must deal with or reason through their chaotic impulses.

#### **ON THE NATURE OF VALUE:**

Values are the subject of a vast array of scientific and philosophic literature (see Caws, 1967 and Nerlich, 1989). Rejecting the idea of absolute determinism (i.e. that no one ever truly acts freely) men can be described to exist in a state of formal freedom which approaches essentially doing as one pleases. The primary distinction to be drawn in this description (i.e., one doing as one pleases) centers on man's ability to differentiate between what they want and what they value. The former is said to be tied to our desires while the latter is tied to calculating what one wants now (immediately) and what one wants, globally, in the long term (Nerlich, 1989).

This description might further be refined by noting Hume's account of the role of passions in action and his definition of beliefs, as reason subordinated to that passion in all voluntary acts (Hume, ed. in Monson, 1963). This refinement, for clarity, might also be contrasted with the Platonic view that the reasoning nature of men holds their wanton and competitive natures in check and balance. Where these two natures are defined as desire, reason functions to value various courses of action in such a manner as to curb the lust of wanton desire while at the same time choosing the

appropriate competitive action (desire) to engage in for truth and goodness (Plato, ed. in Cornford, 1941).

**FORMAL FREEDOM AS HUMAN NATURE:**

In a state of 'formal freedom' human nature is expressed (hence remembered) through the cultured life of each person. This life is functional on at least three levels which include: a set of both cultural norms (learned behavior) and understandable sounds and symbols (a common language); the reality that we construct our own unique nature in light of the traditions and meanings of our respective cultures; and the fact that it is our nature to produce our own individual and communal lives (Nerlich, 1989). As an example Marx defined our 'homo economicus' cultural existence as essentially being people producing a material life (this included both a private and communal life), in planned constructions out of a material world, which itself becomes humanized by the reflection of our nature in our products (Marx, ed. in Feuer, 1959).

**HUMAN NATURE AS VALUE:**

In a very practical manner this means that a fully developed human nature is acquired in the process of a person producing his/her particular life. More to the point, however, virtue in one's life, in an Aristotelian sense,

becomes the acquisition of habits to include skills, techniques and know-how that are of value (see Aristotle, ed. in Guthrie, 1962). This particular value (virtue) is not a guarantee of a good life because it has no control, in itself, over our choices. It is the product, instead, of our individual and/or collective self-obtained knowledge that without deliberative reason cannot provide the motivation (sufficient or necessary reasons) to act (see Aristotle, ed. in Guthrie, 1962).

Where this particular value is ignored or fails to be considered in our judgements (actions) with regard specifically to new technology, that technology has the potential for not being grounded, in any meaningful way, in the virtue in our lives. It lacks an appropriate frame of reference with which to achieve remembrance as a distinctly human artifice. This in turn can lead to its being valued in respect to itself, thus losing meaning to future generations on any basis but a self-legitimizing one.

#### **VALUE AS CULTURALLY DERIVED:**

It is generally known that there are various modes of thought from which we derive values. Table 1, on the next page, summarizes these various modes and their particular meanings. Of these various sources for values, authority is probably the most significant in determining our values and includes not only a traditional cultural aspect (e.g.

Table I: Common Value Modes

MODE	EXPLANATION	SUMMARY
1. Authority	Taking someone else's word, having faith in an external authority	I have faith in an external . . . (Religion).
2. Deductive Logic	Subjecting beliefs to the variety of consistency tests that underlie deductive reasoning	Since A is true, B must be true, because B follows A.
3. Sense Experience	Gaining direct knowledge through our 5 senses.	I know it's true because I saw it, . . . etc., etc. .
4. Emotion	Feeling that something is right.	I feel that it is true.
5. Intuition	Unconscious thinking that is rational rather than emotional.	The solution to a problem comes to me and I know it is right.
6. Science	A synthetic technique that relies on sense experience to collect facts and use reason and intuition to logically reach conclusions.	I tested the hypothesis by an experiment and it proved to be true.

Source: Lewis, A Question of Values, 1990, p. 10-11.

authority figures and organizations) but also the more contemporary notion of technical expertise. This latter notion is a result of technical specialization in most fields

of human activity. This specialization causes us to seek expert advice and/or expert opinions to determine the value or merit of various courses of action and decisions (Lewis, 1990).

**VALUE AS INTERNALLY DERIVED:**

As a scientific mode of value, psychology has gained a prominent role in our contemporary view of valuing behavior. Freudian psychology is probably the best known descriptive mode, and deals with how we cope with our perception of ourselves in relation to our environment or particular situation through various defense mechanisms. Table 2, 3 and 4 summarize this internal mode of valuing.

The emphasis of this mode is that our behavior is a result, primarily, of the internal value driven schema shown in table 4 on page 20. As a value system this schema offers survival, adaptation and maturation (the process by which humans adapt and survive) as the highest observable goals of life. It operates to reduce conflict with others and within our self as a means of adaptation while regarding so called "maladaptations" (e.g. immature or neurotic defenses) as problems to be overcome with the right kind of technical knowledge (see Vaillant, 1977).

**Table 2: Freudian Psychology and Internal Values**

<b>PSYCHOTIC DEFENSES (normal for ages 1-5)</b>	
Delusional Projection	Paranoia, Persecution Complex. "They are after me."
Denial	"I am not in a hospital."
Distortion	"I am Napoleon or God."
<b>IMMATURE DEFENSES (normal for ages 3-15)</b>	
Projection	Blaming others; Attributing one's feelings to others. "I hate myself," expressed instead as "They hate me."
Schizoid Fantasy	Repellently eccentric; Incapable of human intimacy.
Hypochondria	Imaginary illnesses (although the symptoms may actually be quite real).
Passive-Aggression	Making others feel guilty; Being stubborn and willful but dependent; Being inactive, unresponsive, or passive to the point of self-destruction.
Acting Out	Given to impulse, no matter how self-destructive. Like fighting, drinking, non-stop sex, drugs or the likes.

Source: Lewis, A Question of Values, 1990, pp. 114-115.

**Table 3: Freudian Psychology And Internal Values Continued**

<b>NEUROTIC DEFENSES (conflicts inside one's self)</b>	
Dissociation	Chronic desire to escape.
Reaction Formation	Overcompensation (e.g. trouble with sex become monk).
Repression	Whatever bothers you doesn't exist- accompanying hysteria.
Intellectualization	Hiding; Find lots of projects to hide in.; Need to be in control.
Displacement	Substituting; Get a car or house instead of what you really want.
<b>MATURE DEFENSES</b>	
Humor	Provides detachment, perspective, emotional release.
Altruism	Forget own fears by helping others.
Sublimation	Throwing self into useful work, being creative or achieving.
Anticipation	Looking ahead, anticipating future problems, taking corrective action now.
Suppression	Toughness, stoicism. Don't kid yourself, just accept things as they are.

Source: Lewis, A Question of Values, 1990, p. 115-116.

**Table 4: Internal Value Schema**

- 
- o We develop and rely on unconscious habits or coping mechanisms.
  - o There appear to be at least three of these habits, namely:
    - Denial
    - Escape
    - Externalization (i.e. blaming or helping others)
  - o These three basic defenses may be expressed either positively or negatively, depending on the situation and one's particular normative values.
- 

**Source: Lewis, A Question of Values, 1990, pp. 118.**

**REASON AND VALUE:**

To be sure, there are many schools of thought on how reason is connected to values. Without reason, rational action (its main antecedent) would be a hopeless state of affairs relegated solely to desire (i.e. so called 'subjective' valuation). The major schools of thought here referred to are the cognitive, non-cognitive, naturalist, existentialist, intuitionist, phenomenalist, hedonistic, and cognitive underdeterminist schools. This is a substantial amount of ground for anyone to cover and is marked by sometimes major and minor distinctions in meaning among these

schools with regard to so called 'motivating' or 'grounding' reasons.

These distinctions generally center around the issue of whether or not reason can exist without desire or want. Their purpose is to determine what is necessary (e.g. a necessary condition) for a reason to be able to motivate an action (discussed, first, by Hume). On this issue, most of these schools begin with the proposition that an actor must want something before motivation, hence action can take place. Value in this basic proposition is generally defined as the recognition (cognitive or otherwise) that there is something of worth to be achieved by acting (Williams, ed. in Ross, 1979, Mackie, 1977, Taylor, 1966, Beehler, 1978, Harman, 1977, Foot, 1972 and Nagel, ed in McMurrin, 1979).

#### **REASON AND DEONTOLOGICAL VALUE:**

Among the more significant implications of the previous discussion with regard to reason is that there can be no reason for action that, of its own nature, is a reason for everyone. This is because reason, as it refers to value, is contingent on each person's short or long-term recognition that there is sufficient worth (value) to motivate that person to act.

Since moral reason (deontic value) is understood to be both universal and objective, it must apply to all rational agents. Adoption of the contingent view of value thus denies

that there can be any objective basis for moral values (see Williams, Beehler, and Phillipa Foot as previously cited). A significant variation of this view is that of Rawls and Richards that contingent short and long-term-desire-satisfaction is not relevant if one assumes a life process over which optimal choices eliminate the need to act on any other than an optimal-life-view basis (Rawls, 1971 and Richards, 1971).

#### **WANTS AS REASONS:**

Motivating reasons, thus, are directly related to each person's desires or wants, albeit immediate, long-term or lifetime wants. These reasons, are sufficient and necessary for a person to act in the world. They are said to be externally motivated when they are caused by objects or ends outside of ourselves (e.g., introducing a new technology). They are internally motivated when they come about from our own particular conscious and unconscious desires (e.g., the classic concept of wanton or competitive appetites). In all of these senses, value, if at all attached, is the result of contingent (subjective values) and particular wants against which, once recognized by a free agent as having value to that individual, it would seem unreasonable to them not to act. Most of the schools mentioned agree on these descriptions and understanding regarding motivating reasons (Bond, 1983).

**VALUE AS REASONS:**

Describing the nature of grounding reasons, however, is where most of the schools depart company. Grounding reasons are those objectively derived by deliberation on an external or internal end. They are, if you will, value judgments. For those who believe that desires and reason are inseparable some internal connection between value and desire is explained, in reflection of which, formal reason requires valued consequences to be acted on in some hierarchical value order (e.g., as implied by some variant of Bentham's utility theory). For those who reject this inner connectivity of value and desire, they explain reason as the process of recognizing value as an end sufficient, as it were, to motivate action but not actually requiring that the action be taken. In either case, grounding reasons are the deliberated recognition of value that is either sufficient or sufficient and necessary for rational acts (Bond, 1983).

**RATIONAL ACTION:**

Philosophy makes the case for at least four categories of reasons that constitute sufficient and necessary or merely sufficient conditions for rational activity. These include reasons related to acts of simple inclination (category 1), acts done for emotional reasons (category 2), acts done due to unwilled desires or aversions (category 3), and acts done

because the end is seen as desirable or good or valuable (i.e. valued normatively as a worthy end or valued instrumentally as the most efficient means to a worthy end) (category 4).

Within the framework of these categories further distinctions in meaning should be noted with regard to rational action as a consequence of formal reasoning. For instance, it is a sufficient condition for an act to be done because a person believes that he/she desires something (i.e. category 1 action). This is also true, when as a means to satisfy a want, persons claim they have a reason to act whether their want is actually true or not (i.e., real or only perceived) (category 2 and 3 action). Action based on reasons related to these categories is only reasoned to the extent that an actor thinks that he/she is acting with a reason. Conversely, action that is based on reflective deliberation about the nature and consequences of the act, where some value is recognized in the act (i.e. category 4 action), is what is most commonly called rational action (Bond, 1983).

When distinguishing between reasons for acting, motivating reasons are most often associated with acts in categories 1, 2 and 3. Grounding reasons are associated with acts in category 4. Values, in the context of category 1, 2, or 3 acts, if at all assessed, are described as being purely subjective. Values recognized in category 4 acts are

considered to be either subjective or objective depending on whether one confounds desire with reason. Rational action can either be normatively or instrumentally valued based on these recognized values (Bond, 1983).

#### **SCIENCE AND THE PROBLEM OF OBJECTIVE VALUES:**

Objective value is desired in all purely scientific evaluations. This is because the scientific method consists

**Table 5: Outline of Scientific Method**

- 
- I. Gather all the available facts (sense experience).
  - II. Immerse yourself in the facts until a solution comes to you (intuition).
  - III. Think through all the logical implications of the proposed solution (if A is true, B and C must also be true).
  - IV. Devise an experiment to test the validity of B and C against the same facts. Also satisfy a number of stringent conditions:
    - o The facts must be clearly and objectively stated (no hidden bias).
    - o The key research variables must be independent (not mixed with other variables).
    - o Experimental procedures must be measurable and repeatable.
- 

**Source: Lewis, A Question of Values, 1990, pp. 109-110.**

of trying to find predictive prescriptions about phenomena through controlled experiments that are capable of being objectively verified by subsequent independent experiments. This method is defined in table 5 on the previous page.

As a mode of understanding, it is prudent to note that not all experiments can claim to be exact science. For this reason it is quite necessary to be sure what mode of

**Table 6: Modes Of Scientific Truth**

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<b>MODE</b>	<b>EXPLANATION</b>
Exact Science	Meets all the stringent conditions required by the Scientific Method.
Inexact Science, Quasi-Science or "Science"	Generally relies on a combination of experience, intuition, and logic but falls short of meeting all the conditions of exact science.
Pseudoscience	Pretends to be scientific but is not even completely factual or logical. Attempts to wrap itself in the prestige of exact science.

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Source: Lewis, A Question of Values, 1990, pp. 110-111.

scientific truths one is dealing with before attempting to attach any meaning to an investigator's hypothesis.

Table 6 lists the various modes of scientific discovery. It should be noted that not all new technology fits the exact science mode of inquiry, due to the practical difficulty in independently and objectively evaluating the effects of all factors in an experiment. The implication is that much of what is passed off as true scientific knowledge with regard to many new technologies is really to be understood as quasi-scientific truth. Consider, for example, the actual complexity of a nuclear power plant. Try designing an experiment to independently account for and objectively measure all possible factors relating to the potential for a core melt-down. In fact, as recent events have reported, investigators are still not certain about all the possibilities related to the Three Mile Island nuclear power plant (see Oregonian, August 25, 1991, p. A-12).

#### **IMPLICATIONS FOR OBJECTIVE VALUE:**

For any of these modes of scientific inquiry, objective values can be summarized to include a consideration of the following facts. 1). Motivating reasons are internally tied to personal desires. 2). Grounding reasons are internally tied to value. 3). Our desires (motivating us to act) will always be good when they are recognized through reflective valuation. 4). Rational motivation implies that whatever

reason one recognizes, is the reason which one values to act upon. 5). the union (e.g. like the mathematical union of sets) of motivating and grounding reasons occurs when one recognizes that a value can be attached to a good consequence by acting. 6). Except in the case of instrumental value, grounding reasons cannot exist unless the end in question actually has value. 7). It is neither a sufficient nor necessary condition that an end be worthwhile to be desired whether or not one's factual belief about an act is true (Bond, 1983).

These implications argue that deliberative reason requires a careful determination not only of the facts surrounding a particular technology but also their meaning within whatever mode of scientific truth operant with that technology. It further implies that one also distinguish the desirability of any specific end by concerted reflection on its relative value, i.e. its value as an end in comparison to all other relevant ends. The values being referred to are, of course, not instrumental but rather normative values since instrumental values deal only with rationally evaluating the efficiency of a certain means and not with the rational evaluation of the consequences of an end.

#### **CHOOSING VALUES:**

A final distinction about value needs to be addressed. It is that, no matter what value is construed to be by an

actor (i.e. subjectively reasoned desire or objectively reasoned desire), choosing a value from among other competing values requires one to exhaustively enumerate, validate, and eliminate, less valuable ends. Table 7 enumerates some

**Table 7: Value Selection Methods**

<b>METHOD</b>	<b>STEP</b>	<b>EXPLANATION</b>
1	Common Language	Construct language that cuts through specialization.
2	State Values	Enumerate all judgements and value-principles involved.
3	Analyze Values	Take each judgement and totally lay out suppositions and implications.
4	Practicality	Determine the practical consequences of adopting the value or judgement.
5	Validate.	Pragmatically check to see if value is consistent and functions as intended.
6	Get Consensus	Get general consensus to discover underlying needs of all concerned.

Source: Najder, Values and Evaluation, 1975, pp. 159-165.

methods which might help one choose from among various objectively or subjectively valued ends (Najder, 1975). The thrust of methods 1 and 2 is to attempt to eliminate the biases introduced by language and specialization. Methods 3 & 4 are offered to force us to formally reason through the ramifications of acting into the world. Method 5 is a pragmatic, reality check that validates the results of methods 1-4. Method 6 recognizes the need formally to preserve in remembrance the sum total of what it is that is of value in our individual and collective existence (Najder, 1975). With respect to these remembrances (normative values) we can choose an appropriate action in light of its being valuable without regard to our immediate, long-term or life-long desires (goals).

#### **TECHNOLOGY AND VALUE A REPRISÉ:**

The technology dilemma and its importance to our continued human existence having been addressed, the issues of reasoning and objective value and their technological meanings have also been laid out. Additionally a schema for choosing appropriate normative values underlying technologies has been offered. Of particular importance in the discussion of reasoning and values are Bond's observations that "...except as instrumentally valued, grounding reasons can not exist unless an end has actual value..." and that "...ends need not be worthwhile to be desired...". These

observations are key to understanding why the technology dilemma as it has been described, exists. They are also relevant to understanding how new technologies have been and are now being valued.

All current techniques for valuing proposed research and/or justifying new technology applications are based on predominantly instrumentally valued models designed to achieve some desired end. These models, thus, may or may not be connected in any meaningful way with grounding reasons to act. Thus, while they will rank order the most efficient and economical means to an end, they generally are not designed to rank order that end in any meaningful way to all other possible ends essential to man's continued existence.

In the next several sections of this thesis I will present a dialogue describing the various modes and facts relevant to understanding the valuing of technology in an organizational, social, public administrative and political and philosophic context. Later in the thesis I will offer a critique of the methodologies commonly used to value technologies in these settings and relate alternative research aimed at explaining ways to address the shortcomings addressed in the critiques. Additionally, a framework for evaluating technologies which accommodates several areas of concern offered in the critique will be discussed as a potential starting point for the development of a more effective evaluative model to use in the future.

"Professionalism in management is regularly equated with hard-headed rationality. ...The numerative, rationalist approach to management dominates the business schools. It teaches us that well-trained professional managers can manage anything. It seeks detached, analytical justification for all decisions. It is right enough to be dangerously wrong, and it has arguably led us seriously astray."

Peters and Watermann  
In Search of Excellence

#### VALUING TECHNOLOGY IN AN ORGANIZATIONAL CONTEXT

##### GENERAL:

There are many books available on how to be successful. These are generally referred to as "pop-psychology". Peters and Waterman made business literary history in 1982 with their book, In Search Of Excellence. All subsequent business success books have been patterned in the image of this work. From independent research involving 62 Fortune 500 companies, the authors developed what they represented as the essence of running a successful business. Table 8 on the next page summarizes the so called "Excellence Principles" that they developed.

**Table 8: The Excellence Principles**


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<b>ONE:</b>	A bias for action: a preference for doing something-anything-rather than sending a question through cycles and cycles of analyses and committee reports.
<b>TWO:</b>	Staying close to the customer-learning his preferences and catering to them.
<b>THREE:</b>	Autonomy and entrepreneurship-breaking the corporation into small companies and encouraging them to think independently and competitively.
<b>FOUR:</b>	Productivity through people-creating in all employees the awareness that their best efforts are essential and that they will share in the rewards of the company's success.
<b>FIVE:</b>	Hands-on, value driven-insisting that executives keep in touch with the firms essential business.
<b>SIX:</b>	Sticking to the knitting-remaining with the business the company knows best.
<b>SEVEN:</b>	Simple form, lean staff-few administrative layers, few people at the upper levels.
<b>EIGHT:</b>	Simultaneous loose-tight properties-fostering a climate where there is dedication to the central values of the company combined with tolerance for all employees who accept those values.

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Source: Peters and Waterman, In Search Of Excellence, 1982.

**ON THE NATURE OF ORGANIZATIONAL EXCELLENCE:**

It should be noted that the "Excellence Principles",

by their authors' own admission, are of the quasi-scientific mode of truths about organizations. Behind the principles are several fundamental propositions. One of the most important is that excellence in production (e.g., the excellence inherent in a craftsman's work), whether goods or services, requires people who are motivated based on simple, beautiful and compelling values (see Pirsig, 1974). Another is that numerative analysis has a built-in conservative bias which makes cost reduction the most important operant value in organizational decision making (see Thurow, 1980). This exclusively technical analysis leads to an abstract analytic value philosophy that discounts other human, moral and material considerations (see Kuhn, 1970).

Another proposition is that the narrow rationality, previously described, is most often negatively directed (see Drucker, 1969). This rationality does not value experimentation and absolutely rejects mistakes (see Gilder, 1981). Finally, an anti-experimental attitude leads to organizational complexity and inflexibility and resulting aversion to informality, internal competition, and a loss of basic normative values (see Argyris, 1967).

#### **THE EVOLUTION OF ORGANIZATIONAL THEORY:**

The excellence principles are factually laden with several important developments in organizational theory. The history of that theory is depicted in figure 3. Of

	<b>CLOSED SYSTEM</b>	<b>OPEN SYSTEM</b>
<b>RATIONAL ACTOR</b>	<b><u>I.</u></b> <u>1900-1930</u> <u>Weber</u> <u>Taylor</u>	<b><u>II.</u></b> 1960-1970 Chandler Lawrence Lorsch
<b>SOCIAL ACTOR</b>	<b><u>III.</u></b> 1930-1960 Mayo et al. McGregor Barnard Selznick	<b><u>IV.</u></b> 1970-???? Weick March

**Figure 3: The Development Of Organizational Theory**

Source: Peters & Waterman, In Search Of Excellence, 1982, p. 93.

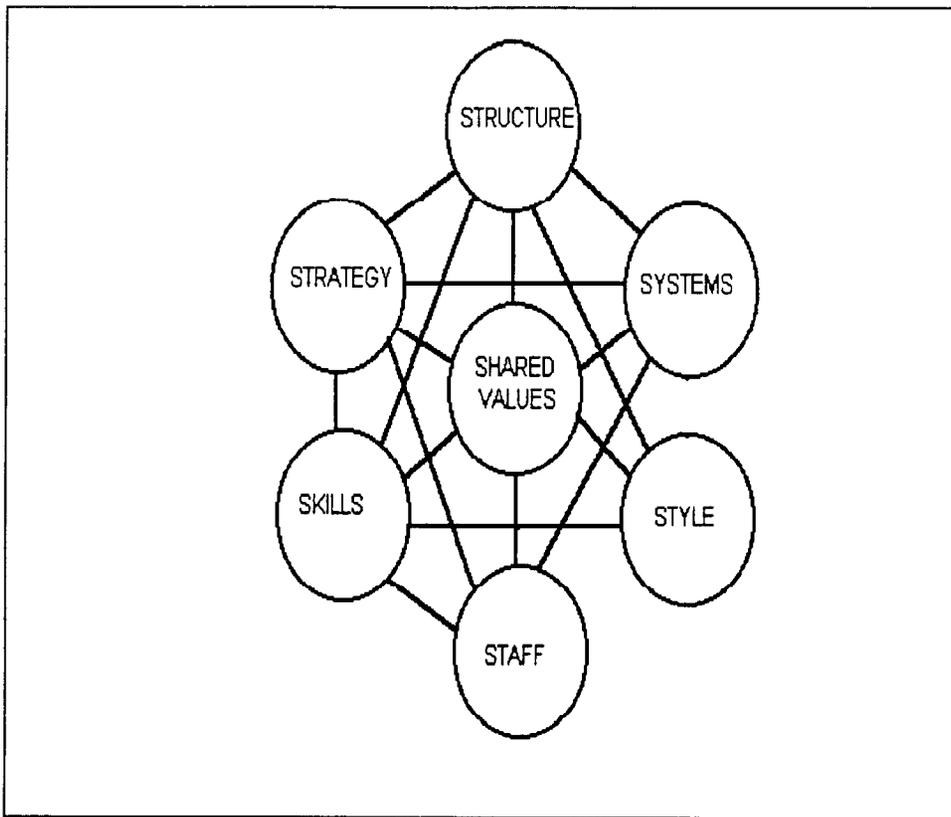
importance in this litany is the implication of dealing with people in the context of rational or social management and decision making within closed or open organizational structures. In this context the organizational view of people has evolved from one of laborers in the classic Marxian sense as a means of production to present day notions of management and labor teams as autonomous and valued organizational resources. This latter notion, in the works of Weick and

March, forms the basis of what is now called the Human Resources Model (HRM) of Organizational Management (see Weick, 1979).

In this model, management and labor jointly participate (in an egalitarian sense) in respect of a value driven "corporate culture" where each is recognized, in his/her own right, for making valuable contributions to the company as an autonomously motivated corporate resource. In HRM each person autonomous as it were through a shared culture, can experience the satisfaction of his/her own particular needs in a way that helps him/her self-actualize (see Maslow, 1970) through the success of the company reinforced by economic and other esteem related rewards (see B.F. Skinner, 1971).

#### **THE 'HRM' AND GROUNDING REASONS:**

The HRM has been explained through various models. A key model is the McKinsey 7-S Framework shown in figure 4 on the next page. This model has often been dubbed as the "Happy Atom" for obvious reasons. It demonstrates that the subsystems of organizations are interrelated and through a shared set of corporate values become united in achieving success for the organization as a whole while maintaining an intricate web of formal and informal ties (see Mintzberg, 1973).



**Figure 4: The McKinsey 7-S Framework**

**Source: Peters & Waterman, In Search of Excellence, 1982, p.10.**

The point to emphasize here is that an internalized value driven culture is central to modern corporate entities. Shared corporate values to be sure are described as being normative within the context of the organization. This perhaps could qualify them as grounding organizational reasons for people to act. Once internalized by an employee, however, they become not only sufficient but also necessary conditions previously defined as motivating reasons for action in the world. The greater implication for this kind of

reasoned action especially as pertains to making normatively valued technology decisions relates to how much and what value organizational grounding reasons or internalized organizational motivating reasons have in comparison to other recognized non-organizational and human grounding reasons to act in the world.

#### **THE 'HRM' AND MOTIVATING REASONS:**

A second contemporary framework relating to HRM is the 'Human Resources Wheel'. In this framework the focus is on rewarding the achievement of corporate goals. These goals are related to the value driven culture previously related. In figure 5 on the next page we can see that the goals are at the heart of all functional organizational behavior. The compartments in the outer concentric circle imply the autonomy of each function's contribution. The pervasiveness of shared value driven goals further implies the need for a common focus. In conjunction with that focus and in respect to each autonomous function, importantly, however, reward is emphasized (Byars & Rue, 1987).

Reward is largely the result of the influence of organizational behavior theory on organizational management. It has a history closely tied to the various forms of organization theory previously shown in figure 3. Behavior theory has, generally, been derived from scientific behavior

experiments with animals and humans. It is thus of the mode of exact and quasi-scientific truths.

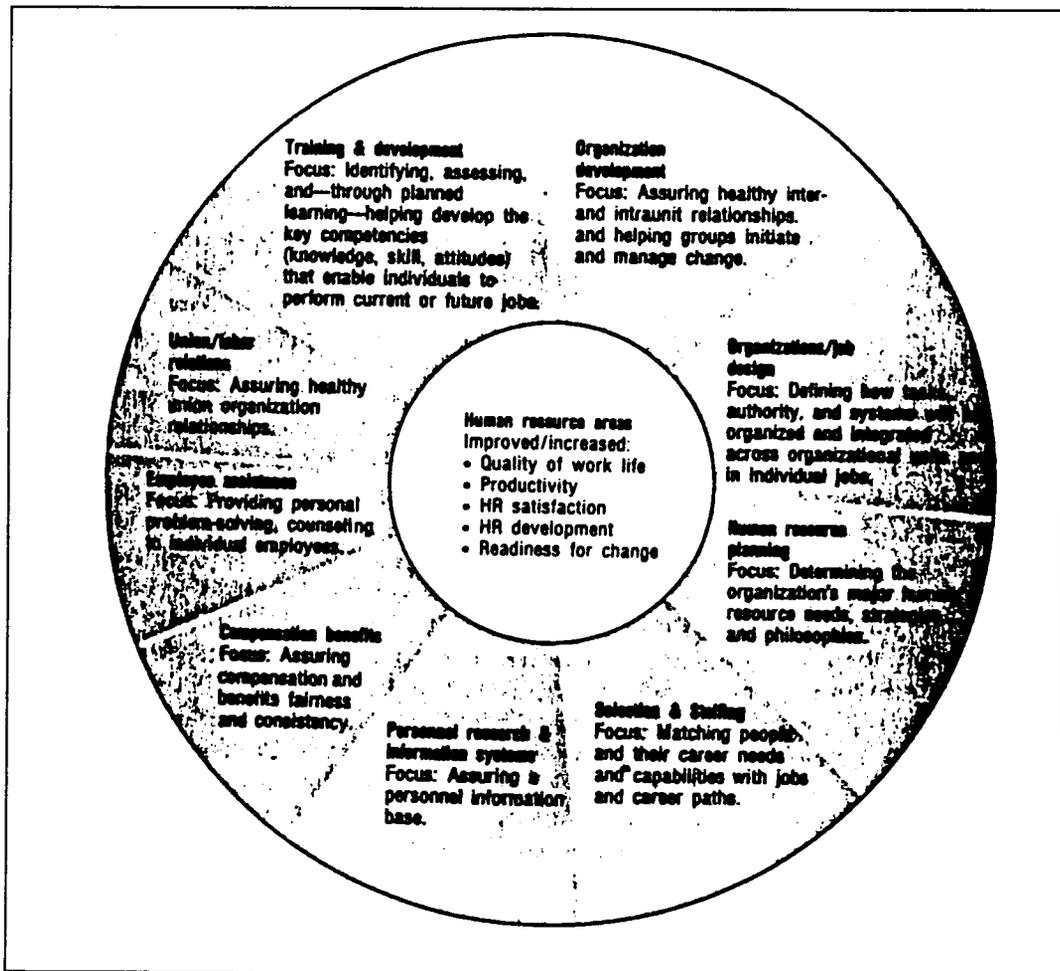


Figure 5: The Human Resources Wheel

Source: Byars & Rue, Human Resources Management, 1987, p.8.

Its more significant contributions have been in the area of "attribution" theory and "stimulus and response" theory (see Mills, 1985) in the rational closed and open organization structural context and "hierarchical need satisfaction" (see Maslow, 1970) and "negative and positive reinforcement" (see

B.F. Skinner, 1971) in the social closed and open organization structural context.

The union of behavior science with organizational science in the HRM context is best characterized by the Greatest Management Principle (GMP) shown in figure 6 on the next page below (see LeBoeuf, 1986). Of note is that reward directly relates to motivational reasons as we have discussed them previously. Organizational rewards establish arbitrary values on the consequences of various corporate actions which, if recognized by a corporate actor as valuable, are sufficient and necessary conditions to motivate action in the world.

The critical implication for this kind of valuing process is that it does not consider the normative human value of the corporations' deliberate action to determine how much is enough to get a particular actor to recognize a corporately valued consequence as personally valuable to accept. A greater question as specifically relates to corporate decisions to opt for a particular technology is what objective and normative value can one attach to the consequences being arbitrarily valued by the corporation. In this regard for instance, the social consequences of introducing entrepreneurial spirit into the organization has been shown to be a propensity to diversify into disaster-prone technologies. For mankind, this may well be more valuable to avoid, when objectively deliberated, than the

ALWAYS PRACTICE THE BASICS		
1. The things that get rewarded get done!		2. If not getting the results you want, ask magic question: What's being rewarded ?
YOUR STRATEGY: TO KNOW WHAT TO REWARD		
"THE 10/10 MANAGEMENT SYSTEM		
Always Reward:	Instead Of:	10 Best Ways:
1. Solid Solution 2. Risk Taking 3. Creativity 4. Decisive Action 5. Smart Work 6. Simplification 7. Quietly Effective Behavior 8. Quality Work 9. Loyalty 10. Working Together	1. Quick Fixes 2. Risk Avoiding 3. Mindless Conformity 4. Paralysis by Analysis 5. Busywork 6. Needless Complication 7. Squeaking Joints 8. Fast Work 9. Turnover 10. Working Against	1. Money 2. Recognition 3. Time Off 4. A Piece of the Action 5. Favorite Work 6. Advancement 7. Freedom 8. Personal Growth 9. Fun 10. Prizes
THE BOTTOM LINE: EVERYONE WORKS SMARTER WHEN THERE'S SOMETHING IN IT FOR THEM!		

**Figure 6: The Greatest Management Principle In The World**

Source: LeBoeuf, GMP: The Greatest Management Principle In The World, 1986, pp. 136-137.

corporation's subjectively valued entrepreneurial interests, in spite of the corporation's motivation to act differently. Society's rejection of unabated adoption of these entrepreneurial synergies would conform to what we have previously defined as exercising the 'rational premiss' with respect to taking deliberately valued human action.

On the contrary acting on corporate reasoned goals and corporate rewarded motivating reasons, even if recognized as valuable in a category 1, 2 or 3 sense by the employee, would be akin to engaging in action valued, subjectively, only in the particular certainty concerned with that employee's immediate, long-term, or life-term knowledge about the desirability to be more entrepreneurial than less. The fact that this thinking would further be internalized if corporate culture were evident and self-gratifying in terms of incentive rewards concerned only with the internal values of the corporation makes these acts purely subjective and denies any rational deliberation of alternative normative ends. It is this kind of valuing that has been shown to sustain the relative ignorance of ends presented by the technology dilemma.

#### **ORGANIZATIONAL MAN:**

Gordon, in The IACOCCA Management Technique, sums up the impetus of organizational man as follows "...In our well developed philosophy of management, a 'people centered'

structure will percolate with ideas because of an atmosphere that encourages creativity, openness and balanced risk taking. In short give the troops their freedom from the top-down orders of the officers, and brace yourself for a wave of 'unique productive ideas'...". The result of which is to empower otherwise ordinary men and women "...to act more like entrepreneurs, like the owners of their own businesses - to let them know that there are rewards for sensible risk taking (Gordon, 1985).

The greater implication of this kind of rhetoric is that organizational culture has supplanted otherwise normal human culture with its own management and behavioral theory laden modes of understanding and quasi- and pseudo-scientific facts relating to those theories. Sharing in corporate values, to be distinct in our meaning about our modes of understanding organizations and the acts of their managers and employees with respect to technology decisions, is allowing for the cooptation of other basic human values in making these decisions. This is particularly true on an individual level with respect to the issue of becoming "a company man". Dalton in Men at Work makes the point that the ethics of "...protective coloration in organizations ..." , i.e. the action of employees to think and act in accordance with the organizations goals or in respect of corporate incentives to adopt those goals "...is perhaps the most pressing necessity

impeding the development of a mature organizational theory..." (Dalton, 1955).

Recalling Marx's description of human behavior, we are reminded that the consequence of human economic behavior was suppose to be the production of distinctly human products from a material world. Where this production is grounded in organizational values as expressed by the corporate culture and organizational motivating reasons as rewarded by corporate incentives, the pragmatic verification of the truth (recalling Najder's method 5 for choosing normatively valued ends) of Marx's proposition regarding the making of distinctly human products from a material world seems questionable.

#### **UNDERSTANDING THE MEANING OF ORGANIZATIONAL REASONS:**

**GENERAL:** Recalling the work of King and Bella, when technologies get out-of-control, only two modes of understanding these technology decisions fit so called "rational actor" scenarios. These were the intentional subversion of public interests by private ones and the self-legitimization of new processes (King and Bella, 1992).

With the first mode it is clear that motivating reasons are at the heart of understanding why businesses and other organizations act in their own interests. The question is, of course, whether these acts are humanly valued in any objective or normative sense. When organizations attach

arbitrary value to human acts that fulfill organizational desires (e.g. introducing technology only because it is economically advantageous to the firm) without regard to their social and other consequences it seems clear that there can be no real human normative valuing going on. When workers further internalize those corporate values a union is achieved between grounding organizational and human motivational reasons. Where deliberation at this union is void of constructive enumeration of all objectively determined human values, rational choices can hardly be possible, let alone assured.

**DISTINCTIONS OF FACT:** With regard to the second mode of understanding how technologies can get out-of-control, one must recognize what King and Bella call "...the double-filtering of values" (King and Bella, 1992). This can be demonstrated in the ways that people, organizations, and cultures, in general, treat the measures, models, and tools they design and use.

**MODELS:** In a first sense of filtering, exact, quasi- and pseudo-scientifically designed entities are generally perceived as valuable to some end. However, by their mere existence, these entities can also suggest other ends. In modelling for example, all models are based on certain limiting assumptions, without which, it is implied, the model would be impossible to run in any "real-time" application. Models, by their mere existence, therefore

embody some perception of what constitutes an acceptable set of starting assumptions and by implication what is acceptable as a "real-time" application.

In a real sense, our understanding of what modelling means predefines the problems to which we apply models. It is a filter which, through repeated application to problems, automatically suggests a certain accommodation of simplifying assumptions whether these assumptions are valid or not. Likewise, it suggests that more complicated models are to be avoided as unworkable and certainly impractical (i.e., not worth the time and money invested in their development) (see Abbott, 1988).

**MEASURES:** Similar filtering can happen with regard to various organizational measures. King and Bella cite Johnson and Kaplan (1987), for example, showing how standard business accounting measures predefine the nature of manufacturing costs as being less related to direct labor and variable costs and more related to fixed costs.

The point they were making was that this predefinition of measures fails to account for the fact that a greater portion of a period's current costs affect future period profits than they do the current period's profits (see Johnson and Kaplan, 1987). Goldratt and Cox further translate this measure bias into the understanding that the way we account for costs is really the reason why American manufacturers are locked into defining businesses as low

cost, mass production oriented as opposed to their strongest competitors, the Japanese, who define businesses as low cost, mass produced variety oriented (see Goldratt and Cox, 1984).

**TOOLS:** With respect to filtering caused by tools, Weizenbaum provides the example of the application of computers to most every human endeavor. He points out that "... there is a myth that computers are today making most of the decisions...of the kind previously made by people" (Weizenbaum, 1976). His point is that "...the tool as a symbol... transcends its role as a practical means toward certain ends" (Weizenbaum, 1976).

Computers, in reality, can only help to simplify decision making even in respect of current artificial intelligence advances. As management software is developed and implemented it gives the decision maker only the speed and flexibility built into the software. If you will, the software is predefining management problems to fit the software.

The paradox, that Weizenbaum explains is that, "...people are maintaining the illusion, and it is often just that, that they are, after all, the decision makers..." due to the capabilities and limitations of computer technology. However the computer has in fact transcended its role when, in fact, it is the computer that is defining reality according to its software (Weizenbaum, 1976).

A recent example is the case of Mr. O, whom no one (no business or government agency) will recognize by his real name because their software won't accept a one letter last name. Mr. O was forced legally to change his last name to "Oh" so that he could be entered into everyone's computer banks (see Oregonian, August 26, 1991, p. A-3).

**PARTICULAR MEANING:** This is the rub with normative values and the valuing of actions taken by organizational man. First, from the mode of internal shared values, no one likes a trouble-maker, i.e., it's easier and more rewarding to fit in and become 'protectively colored' than it is to deliberate on the value of acts in any way but a profit motive. Second, from the mode of sensible risk taking, worker autonomy is fine as long as it serves the greater interests of the organization without regard to a deliberative enumeration of interests beyond those of the organization. What is missing in understanding these modes of valuing is that organizations have yet to submit to humanizing intentions and design. Instead of employees adopting and internalizing a corporate shared culture, corporations should adopt and internalize a human shared culture.

What is happening in a normative value sense is similar to what happened in the classic case of 'putting the cart before the horse'. As Thomas Dewey puts it "...what is important is what men decide to do, the process by which they arrive at a decision, and the arguments which enter into the

process. It is only in these areas that value has its full significance" (Caws, 1967).

It should be noted that organizations nor their profit motives are nowhere considered in this description. Organizations should serve men as a means of production, not the other way around. To prevent private interests from usurping public interests, private and public enterprises must first organize on a different premiss than is now largely accepted. Some have argued that this was the intent of Adam Smith all along, i.e. that capitalism is not based on wealth maximization devoid of moral sentiment and sensibilities related to a focus on a "fair exchange" in the marketplace and a more humane objective for economic activity (see Hart, 1985). It should likewise be noted that successful businesses have already been organized on that basis (see McGregor, 1960).

#### **TECHNOLOGY, VALUE AND ORGANIZATIONAL SETTINGS A REPRISÉ:**

All of these modes, distinctions of facts and particular meanings argue for the conclusion that our organizational existence is problem-, purpose- and value- laden, based on our confusion of that existence as a means or an end. Value in this mode of understanding comes from our expectations and priorities with regard to the very instruments that we have designed to fulfill an instrumental function rather than from the deliberate enumeration of the human value underlying our

economic endeavors (Bernstein, 1976). Even more tragically, the value of the technologies being introduced by these essentially economic activities is being determined in respect to what MacIntyre once described as our "understanding...through the stock of stories..." we have for these instruments (MacIntyre , 1981).

The problem with this kind of reasoning and action from a grounding perspective is that technology decisions are being made in reflection of the purely subjective reasoning of an objectively rationalized entity (the organization). This entity exists to fulfill the subjective human desires of its stockholders and employees not the normatively valued ends of the society.

Success within the context of this entity is defined at the union of subjective human desire and subjective organizational desires in respect of the organizations goals which may or may not have any relation to normatively valued human goals. Rewards within the entity are routinely used to induce people to internalize and accept this union of desires with the implication that this union is inherently good. This understanding of organizational life is in contrast to corporate entities that come into being based on human grounding reasons fulfilling, as appropriate by reason, the union of subjective human and organizational desires.

Were this situation not bad enough, however, double filtering can also occur because of our failure as humans to

come to grips with this value dilemma. In particular this means that though our scientists and technical specialists purport to have expertise (specialized knowledge) with regard to technology decisions, they in fact do not understand these technologies because of their failure to identify their underlying grounding human value. Additionally, regrettably, this situation is compounded because they do not understand that they do not understand these technologies (King and Bella, 1992). This, of course, leaves humans having to assume the risk for this lack of understanding and having to deal with out-of-control technologies, each with a life of its own.

**"There are only one or two truly human stories and they go on repeating themselves as fiercely as if they had never happened before."**

**Willa Cather**

### **VALUING TECHNOLOGY IN A SOCIAL CONTEXT**

#### **GENERAL:**

We have touched on the concept of 'formal freedom' as essentially doing what one pleases in an individual sense. Maslow further points out that freedom is required before individuals can satisfy all other needs (see Maslow, 1970). But this freedom, as we have defined it, rests upon our contingent desires and our ability to be rational while acting in the world. Freedom thus, can be viewed as the voluntary subjection to the highest value, achievable, if you will, by a constant search for truth as the means to be free. In a Hegelian sense, it is this search that is the history of our individual and collective human or social existence (Zinman, 1989).

#### **A SOCIAL REFERENCE 'A LA' WEBER:**

Sociology, like organizational theory, is a rather large field of study which for our purposes could be viewed from the perspective of any number of sociological theorists. Max

Weber's views are selected, here, as being most pertinent to capitalist societies as developed in the West during the Industrial Revolution. Weber's analysis explains the human conditions required for the growth and continued sustenance of capitalism. Additionally, Weber's ideas have further appeal due to the fact that, like our scientific cosmology, they conceive of social history as guided by a larger dynamic, which he calls "...an international status system..., irreducible to the economic, bureaucratic or other internal interests or the resources of local political actors" (Collins, 1978).

#### **A COMPARATIVE REFERENCE:**

Before examining the details of Weber's topology, it may be important to establish some comparative reference to understand where Weber's social analysis will lead us. Aristotle in The Ethics asserted that all associations have ends. As Aristotle put it, "... observation shows us that every polis is a species of association, and secondly that all associations are instituted for the purpose of attaining some good - for all men do all their acts with a view to achieving something which is, in their view, a good" (Aristotle, ed, in Thompson, 1987). From this we can infer that the good that Aristotle was referring to was what we have set out previously as a grounding reason to act.

Aristotle goes on to describe the evolution of associations from the basic union of men and women to the associations of households to the association of villages and finally the association of the polis (or political association). He states that the polis is the highest good or in our terms, the highest deliberative value.

Aristotle claimed that this progression of association was natural (i.e., in the nature of men). His view was that male/female and master/slave relations constituted the sufficient and necessary reasons to form households. In a similar manner once several households existed they had sufficient and necessary reasons to combine into village associations so that they could satisfy more than their recurrent needs. These village associations, finally, formed into the polis to "...grow for the sake of mere life, and ...to exist for the sake of a good life" which Aristotle concluded to be the truth "...because it is the completion of associations existing by nature, thus every polis exists by nature, having itself the same quality as the earlier associations from which it grew" (Aristotle, ed in Thompson, 1987).

In comparison Weber's social topology reveals a similar causal chain which allows us to discover how capitalist societies came into existence and how they might continue to exist. Weber's social theory gives us some sense of where we must go in discovering the good (valued ends), though

certainty of future events is never secure, by providing us with a framework to understand the meaning of the modes and facts relating to our capitalistic social existence.

An examination of this framework will provide some point to begin a discussion about achieving the highest good in relation to our actions relating to technology. It will assist in the task of objectifying norms considered sufficient to allow us to grow for mere life and necessary and sufficient to allow for our existence for a good life in a capitalist society.

#### **ON WEBER:**

**FAMILY:** The Weberian topology provides an explanation of family, economic, and political associations in the context of capitalism. Weber explains the family as existing on two dialectics. One is a sexually oriented dialectic dominated by kinship bonds (blood bonds). The other is an economic dialectic which responded to the satisfaction of basic needs. Weber argued that the severing of blood bonds, primarily by religious activity, resulted in the rise of entrepreneurial spirit and resulting entrepreneurial synergies.

The mechanics of this transformation are that intermarriages, sanctioned by the church, caused the offspring to take on membership in new human organizations (i.e. extra familial). These organizations stratified along

economic lines by organizing the means of production, labor and markets, in ways that sought to maximize the power of the organization.

As a matter of terminology, Weber uses the descriptions of "class", "status", and "party". His general scheme is that family, based on blood ties and economic motivations, becomes stratified and fractious based on the "status" of particularly formed entrepreneurial synergies ("classes") which projected their power through "party" in an international status system (Roth and Schluchter, 1979).

**ECONOMY:** Weber developed the idea of economic activity by pointing out that the essence of entrepreneurial spirit was to find economic activities that would allow a "class" to monopolize the various labor opportunities presented by the market place. Competition existed between entrepreneurial synergies for these opportunities which reflected each "class'" recognition of its "status" in a greater international status system. This "status" competition was not only operational on an economic level but also on a "party" level. This is to say that a state's "status" was important to establish the legitimacy of any given "class".

Importantly, Weber defined economic activity, like the family, in two important aspects. The first was that he recognized capital instruments (i.e. some medium of exchange) as being essential to a definition and understanding of the marketplace. The second was, in the classical sense, that he

defined the marketplace as being global and essentially free (i.e., a free mode of exchange). For all practical purposes, this meant that Weber viewed economies from a so-called "Wallrasian world view" versus one espousing any particular market circumstances. In contrast to Marx, for example, he viewed the alienation of the labor class as functional, not only in respect to the producer's exploitation of the means of production but, also with respect to his monopoly of labor opportunities and the means of exchange. These views parallel Schumpeter's economics, which emphasized capital as the principle dynamic with respect to entrepreneurial activity, that determined profit in a classical economic sense (see Collins, 1978).

**POLITICS:** Weber viewed international status as the means by which institutional communities, religious communities and rational-legal states could legitimately exist. A legitimacy crisis was, in Weber's view, a sort of give and take based on "status" conflicts.

The dynamics of legitimacy were that a "party", especially a non-legitimate "party", allowed for the plunder of various economic "classes" by more legitimate, competing, status-seeking "parties" and "classes" when global geopolitical conditions allowed such plunder. A legitimate "party", on the other hand, had the role, largely, of regulating the activities of economic "classes" to maintain its legitimacy.

This implied, in Weber's view, a periodic flexing of power to maintain a "party's" claim to legitimacy in the international arena. Key to monitoring this international status, Weber argued, was the military-industrial actions which a "party" and its "classes" engaged in (Dronberger, 1971).

**A SYNTHESIS:** By various accounts, Weber's important contribution to social topology was his recognition that religious activity, especially the Protestant Reformation, created the possibility for a capitalist bureaucratic state and the business-oriented legal system by which it was regulated. This contribution to social understanding is sometimes referred to as the "Weber Thesis" (Dronberger, 1971).

Its implication, for social topology was that it allowed Weber to present essentially two Hegelian dialectics. One was a chain of history explainable as various political balances which either dictated the plunder or regulation of economic classes. The second was a chain of history explainable as a web of social networks and relationships that either maximized or diminished capitalist markets (Collins, 1986).

**RATIONALIZATION AS A DYNAMIC FOR SOCIAL CONFLICT:**

Weber hypothesized that rationalization consisted of a set of tensions which set up social conflicts. These tensions he felt, created the need for consistency and the need to draw out the logical deductions from any particular method of doing things, to include world or other circumstances and particular "class" or "party" views.

This rationalization, Weber argued, goes on at both a practical and ethical level. The former level Weber calls "instrumentally rational", while the latter he calls "formally rational". The point he sought to make was that our need to rationalize helps explain why we bureaucratized in a hierarchical manner in capitalist societies and also helps explain the causal relationships between "status", "class" and "party" on an institutional and social relationship level.

In this regard, rationality in either a formal or instrumental sense, for Weber, was determined by how consistently the consequences of history could be drawn out of one's own value stance (generalized ideal, heuristic) about what actually had gone on. Formal and informal irrationality likewise could be determined by the inconsistencies between history and one's particular value stance.

**WEBER, REASON, AND VALUE:**

Weber did not believe in objective value as it has been presented in this thesis. For Weber objectivity in social science and social policy was the recognition that what we experience in a historical context (event) is determined ultimately by what we are interested in and thus objective only to the extent that history will bear out our perception.

By the time of Weber's writings philosophy had largely rejected the idea of the existence of any deontic norms, this meant that one's understanding of history would have to come from taking various "value stances". Then, in reflection of these stances, through the meticulous application of the scientific method without scientific prejudice, one would account for history. History would thus serve either to prove or disprove the viability of one's own particular point of view.

A problem with this conception from a valuing perspective is that one's own particular "value stances" are, themselves, both non-rational and non-scientific assertions. Weber's views were based on his belief that the world was naturally chaotic. He therefore asserted that no one could ever claim to be rational outside of starting from some particular perspective and carefully proceeding from there to explain one's perspective in light of historical facts. Weber's objective with these distinctions of fact, was to explain the necessity to set up a dynamic that functioned at

multiple levels of society (i.e. "status", "class" and "party") to explain the connection that Aristotle had previously attributed simply to nature in his description of associations.

Rationalization, as a human tension, operated to bring consistency to human associations. Thus as various spheres of power became more and more differentiated by this tension, each in turn became more cognizant of its differences. It also became aware of the legitimate internal and lawful external autonomy of other spheres. This set up conflict along "status" lines and a struggle for legitimacy in the "class" and "party" arena.

As an example, in the business organizational context previously discussed, Weberian rationalization might be seen as the institutionalized rules and principles (corporate shared values, and goals) and their resulting social consequences in the market place (e.g. the 'cola wars' or environmental and consumer activism or other similar "status" conflict). In explaining his causal model Weber particularly used religion as the value stance (filter) to explain social upheaval (Collins, 1986).

#### **THE WEBER TOPOLOGY:**

Figure 7, shows a sketch of the Weber causal chain, explaining the rise and consequences of capitalism in history. In general, Weber viewed rational capitalism as the

entrepreneurial organization of capital, technology, free labor, unrestricted markets and calculable law. From this milieu of factors, the "markers" (instruments of exchange based on ownership of the means of production) for goods, labor and capital were hypothesized to come together in the capitalist market place based on particular entrepreneurial synergies arising from the ownership of property and the efficient use of mass production technology. The co-existence of these factors in one enterprise created the natural tension to further rationalize this organization through the addition of rational technology and through the expansion of each factor's market. The result was supposed to be the distribution of wealth in such a way as to further market demand within a legitimate state and entrepreneurial enterprise.

This required the intermediate support of legal systems to normalize business and social conditions and provide for the plunder or regulation of these economic and social relationships. It would also require some form of culture as expressed in the institutionalized behavior of people that would normalize (i.e. provide an ethic that would allow the further rationalization of) capitalist business enterprises (Collins, 1986).

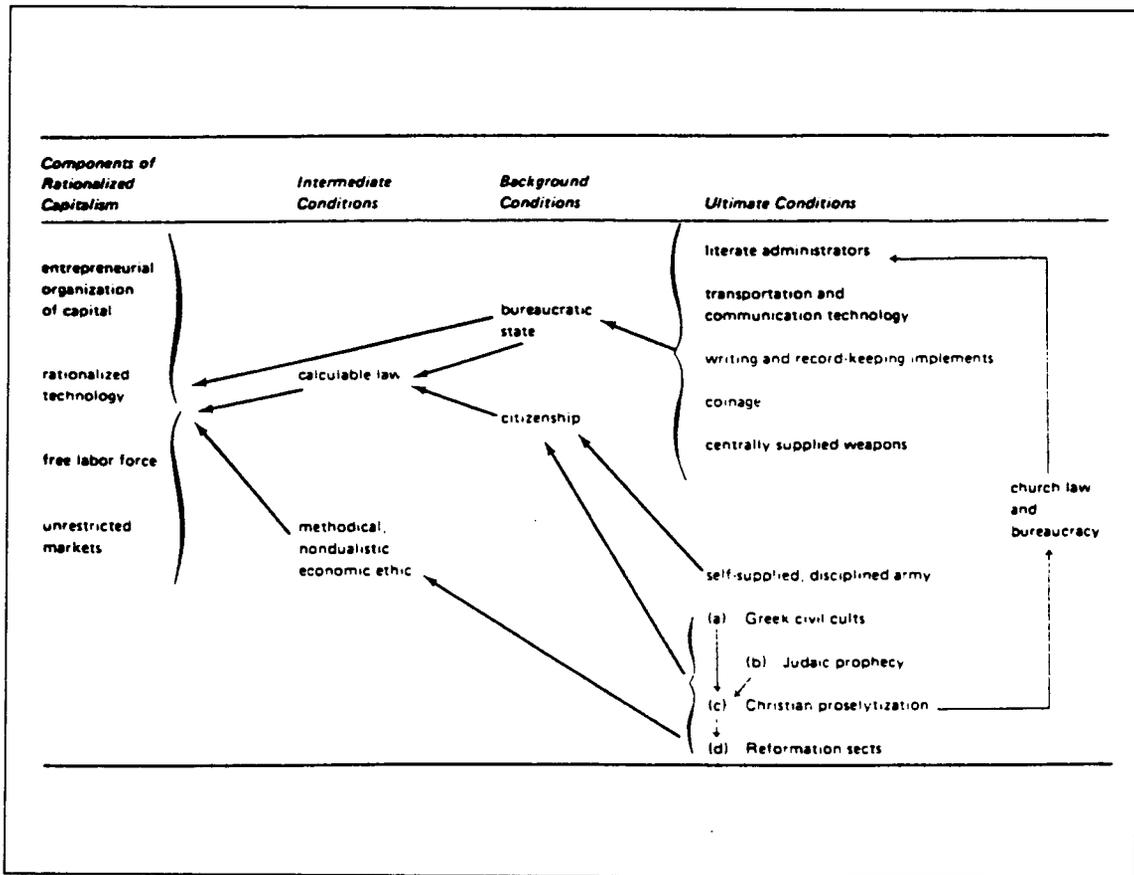


Figure 7: The Weberian Causal Chain

Source: Collins, Max Weber, 1986, p.89.

Weber, with this institutionalized ethic, was addressing the fact that social groups and even tribal societies operate internally by ethical norms with respect to economic transactions. Some examples might be that, 'the exchange must be fair', or 'support one's status' or 'be done traditionally', in some manner, or be 'ritualistically performed', with respect to some tribal or other custom. However, these same associations also operate externally by

another ethic, for example, 'its OK to price gouge', or 'cheat', or 'make a killing' in the marketplace.

For capitalism to thrive, Weber's view was that these competing irrational ethics had to be supplanted by an institutionalized one that encouraged free exchange in the market in a way like our modern businesses that supported the 'bottom line'. The Protestant Reformation with its resultant work ethic, etc., was this particular "value stance", in reflection of which, these conflicts could be ameliorated, while maintaining fertile ground for capitalist expansion of the market for each factor.

Beyond Weber's intermediate supports capitalism needed to have various continued activities. These included: no barriers to the movement of goods; free movement of labor to maximize market opportunities; and labor had to sell its services rather than monopolize its power. The entrepreneur also could not monopolize the market. These activities were previously outlined in figure 7.

#### **WEBER AND RATIONAL ACTION:**

Weber is variously attacked by his scholarly critics on his notion of rational action. Those critics cite the fact that Weber's idea was flawed because it assumed that all choices are irrational due to an innate human inability to be objective. They also criticized the fact that he assumed that the world was itself chaotic and irrational. These

assumptions were neither obvious nor proved, historically, by Weber. Finally they criticized Weber's view, because it asserted, a priori, that the scientific method, itself, was value-neutral when, as we have previously discussed, all schemas by their design necessarily limit our scope of perception regarding any particular investigation and can embody or imply certain values (see Andreski, 1989).

#### **WEBER AND GROUNDING REASONS:**

Weber's schema rejects the notion that objective value can exist in a chaotic state of being. The best that we could hope for, therefore, would be to hypothesize our own particular value stance. In this sense, there can be no objective grounding reasons determined in the manner previously developed. There might, however, be grounding reasons in respect of a subjectively valued end.

#### **WEBER AND MOTIVATING REASONS:**

Weber's concept of a value stance, is most precisely connected with motivating reasons as we have previously described them. This is because value stances, as Weber uses them, subjectively define our perception of the world we live in. They thus fit the role of being sufficient and necessary reasons, if recognized by an agent, to motivate action. Though Weber argues that these value stances can be

objectively verified by scientifically looking at history, they are essentially one person's own point of view.

#### **UNDERSTANDING THE MEANING OF SOCIAL REASONS:**

An implication of Weber's topology, for valuing technology, is that new technology is merely a means of helping entrepreneurial synergies to gain markets and/or "status". In this sense, Weber clearly was suggesting that new technology was benign. His point was that it is the activity surrounding the technology that causes a legitimacy crisis in capitalist societies not the technology itself. The technology, he argued, is essentially value neutral from a human grounding reasons perspective.

Another implication is that legitimate "parties" must develop bureaucratic institutions and social relations that focus on maintaining or improving their "status". This is much like stating that Orwell's "Big Brother" would be the logical result of the ultimate capitalistic rationalization of social activity. Weber clearly alluded to the necessity of efficient bureaucratization of capitalism, based on measurable standards enabled by the internalization of an artificial public service ethic. In this sense he set the stage for the political and public administrative debate over what has since been described as "Technocracy" (see Dickson, 1986).

Weber believed that rationalization of our institutions and government would lead to clear-cut laws and technocratic structures as well as transformed values essential for sustaining capitalistic growth. Akin, in Technology and the American Dream, restates this proposition as technology (technocracy) creates "...a world set free of material want, both through an economy of abundance that would assure a high standard of living and conditioned desire" (Akin, 1977).

#### **TECHNOLOGY, VALUE AND SOCIAL SETTINGS A REPRISÉ:**

It is proper to suggest that from a Weberian social perspective new technology should have been used by man for the betterment of mankind. However, we know from previous discussion that it (technology) can have a life of its own. The crucial dimensions of these opposing ideas lie in understanding how technology is valued.

Where it is valued instrumentally for the sake of efficiency of economy of scale or based on costs/benefits, motivating reasons can be compelling to proceed with a given technology as the most efficient means to an end. Where it is valued, normatively, as valuable in its own right, grounding reasons can provide us with the necessary and sufficient conditions to act with respect to the new technology, bettering mankind.

Albert Teich presents this in a technocratic vein as "...the technological fix accepts man's intrinsic

shortcomings and circumvents them or capitalizes on them for socially useful ends. The fix is, therefore, eminently practical and, in the short term, relatively effective ....But these technological solutions to social problems tend to be incomplete and metastable, and replace one social problem with another ...."(Teich, 1977).

A more effective approach to finding socially valuable technologies might be to seek "...consensus between the major ...parties...and might well put more emphasis on accountability...than on efficiency" (Price, 1983). Indeed Weber's scheme also has suggested this with its idealization of the rational bureaucrat. Accountability, after all, is capable of being normatively valued while efficiency is only ever instrumentally valuable as a means to an end. Consensus on value-principles with respect to researching and developing new technologies by Weber's so-called 'legitimate parties' would be consistent with Nadjer's suggested scheme to enumerate all value-principles and judgements that could be reflectively deliberated upon with regard to any particular technology.

"Science and technology are sources of systematically distorted communication that prevent the attainment of consensus on political issues."

Jurgen Habermas  
Toward A Rational Society: Student  
Protest, Science and Politics,  
1970.

#### VALUING TECHNOLOGY IN A POLITICAL AND PUBLIC ADMINISTRATIVE CONTEXT

##### GENERAL:

Because complex environmental and other problems are often relegated to scientific experts, the ethical questions that are embedded in these problems are often hidden or distorted in scientific and administrative methodology and communication. Values that cannot simply be ignored are usually translated into technical economic language and settled via cost/benefits analysis. Standard risk assessment, also, can be used to distort these values. The narrow scientific training of technical experts leaves them ill-equipped to deal with ethical or value issues in public policy (White, 1991).

It can be added that this failing (narrow training) is becoming no less prevalent in our local, state and national politicians, who are predominantly lawyers by profession (Straussman, 1978). Political philosophy has failed to provide a clear understanding of freedom in the public realm. You will recall

that with respect to valuing, freedom was previously defined as essentially a state of men being able to do as they pleased. Defining this state of freedom in classical political thought, generally, begins with a discussion of Plato and Aristotle. However, these beginnings fail to adequately deal with the central issue of "rule" as the mechanism which legitimizes government in western civilization.

Arendt defined this issue as follows, "the concept of rule is the notion that men can lawfully and politically live together only when some are entitled to command and others to obey" (Arendt, 1963). Arendt went on to say that, since the time of Herodotus, "...freedom was understood as a form of political organization in which the citizens lived together under conditions of 'no-rule', without a division between rulers and ruled" (Arendt, 1963). The notion of 'no-rule' was expressed, in those times, as 'isonomia' (Ehrenberg, 1960) (Vlastos, 1954).

An understanding of the concept of 'no-rule' is argued as critical to understanding political activism in Western democratic societies and the ethics which drive it. Arendt addresses the concept in two works, The Human Condition and On Revolution. As an introduction to political and public administrative valuing of technology, however, I believe that the issue of organizational, social and political accountability versus organizational, social and political efficiency are best understood in the context of 'isonomia', not majority or other rule.

**ADDRESSING POLITICAL/PUBLIC ADMINISTRATIVE PROBLEMS:**

Extensive political and public administrative literature supports the claim that administrative experts are used at all levels to break problems on policy and decision making down into "objective" technical problems and "subjective" bureaucratic policy. With problems reduced to this state, bureaucrats can then apply objective measures to legislative and other administrative guidance, so as to appear to use derived facts to form derived political rules. This in turn allows them to exclude all but the technical cost/benefits from their formal decision process (Brown, 1987).

The result is a satisfying of interests justified by costs/benefits explicitly derived but subjectively dominated by the most powerful political interests or bureaucratic culture. For the dominant interest, this is essentially what has been called the classic "win-win scenario" (Brown, 1987). It likewise conforms with Max Weber's description of the operation of "formal" and "substantive" policy and decision making in administrative and political bureaucracies (Dronberger, 1971).

**MODERN POLITICAL RULE:**

Figure 8 depicts a framework for understanding the dynamics of how "rule" is accomplished in modern political thought. Of particular note in this schema should be the source of power, acquisition of participants and type of activities. The dynamics of

"rule" in this presentation are expressed in the "selection" and "socialization" of the participants and the instrumentalization of activities. Politics is seen as being outside of this instrumental activity, concerned with normatively valued power, but very much involved in the proper selection and socialization of its participants (Henry, 1980).

	<i>Type of Power</i>	<i>Method of Control</i>	<i>Acquisition of Participants</i>	<i>Type of Leadership</i>	<i>Type of Activities</i>
Authority ↑ ↓	Coercive (e.g., a prison).	Physical	Socialization	Officials and informal leaders	Instrumental
	Utilitarian (e.g., a business corporation).	Material	Selection	Officials, informal leaders and formal leaders	Instrumental and Expressive
	Identitive or normative (e.g., a political party).	Symbolic	Selection and socialization	Formal leaders	Expressive

**Figure 8: The Organization Power Continuum**

**Source: Etzioni, Modern Organizations, 1964, p.60.**

Questions can be raised in this framework with regard to political control and activity. Some do point out, for example, that political give and take actually supplants the use of symbolism as a control mechanism in politics (see Downs, 1967 and Thompson, 1967). Others point out that political activity is often

as not co-opted by instrumental interests (see Bunting, 1972). Of importance, however, is that modern politics is experiencing an increasing tendency toward social advocacy in political decision-making. Increasingly people want a condition of "no-rule" in the political and public administrative arena (Henry, 1980).

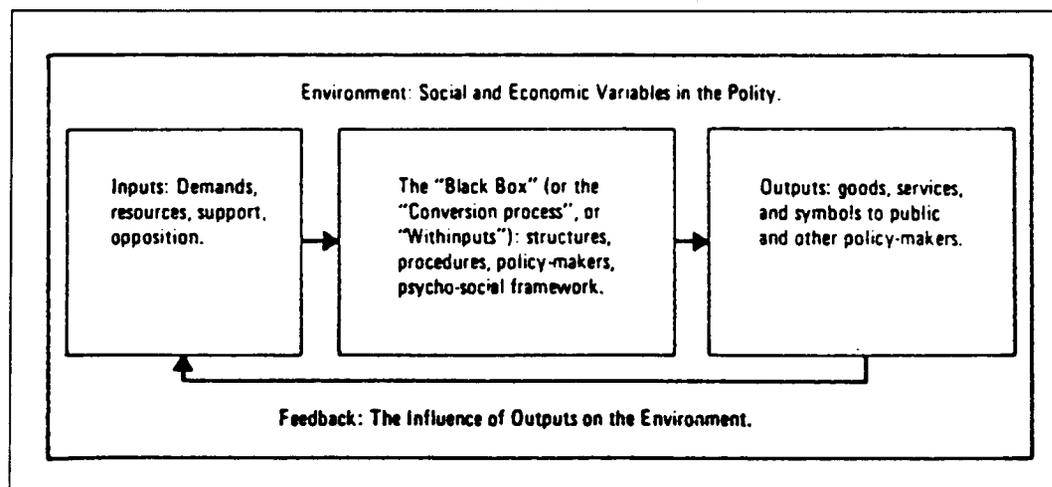
#### **UNDERSTANDING POLITICAL MODELS:**

**ENGINEERING MODEL:** In a real sense, the potential value of science in policy has always been its self-serving notion of objective knowledge. Taken to an extreme this knowledge could be postulated as a basis for a utopian existence, devoid of the vested interests of business organizations, social interest groups and politicians alike (see Veblen, 1921). The so-called "engineering model" of politics is the embodiment of this concept.

In this model experts replace business and political leaders as dispassionate administrators. These experts being in touch with objective knowledge establish rules and policy to maximize social versus other particular interests. Experts identify the one best approach to a particular problem. This approach carries with it the implicit reality that public choice is dictated by technological imperatives (see Ellul, 1964). In the words of Jeffrey Straussman in, The Limits of Technocratic Politics, "Technique, ...takes on an independent character as a mode of thought that establishes its own reality, a rationality determined by technology" (Straussman, 1978).

Technology thus eliminates politics as a consequence of rational choice of the one best approach. Politicians become

symbolic while the experts determine the appropriate course of action. The end result is that politics and by implication politicians eventually vanish altogether. As technology is the paramount determinant of the one best approach, public choice also is subsumed in technological expertise (Straussman, 1978). This mode of thought is the basis of approaches to politics that emphasize public policy making as shown in figure 9.

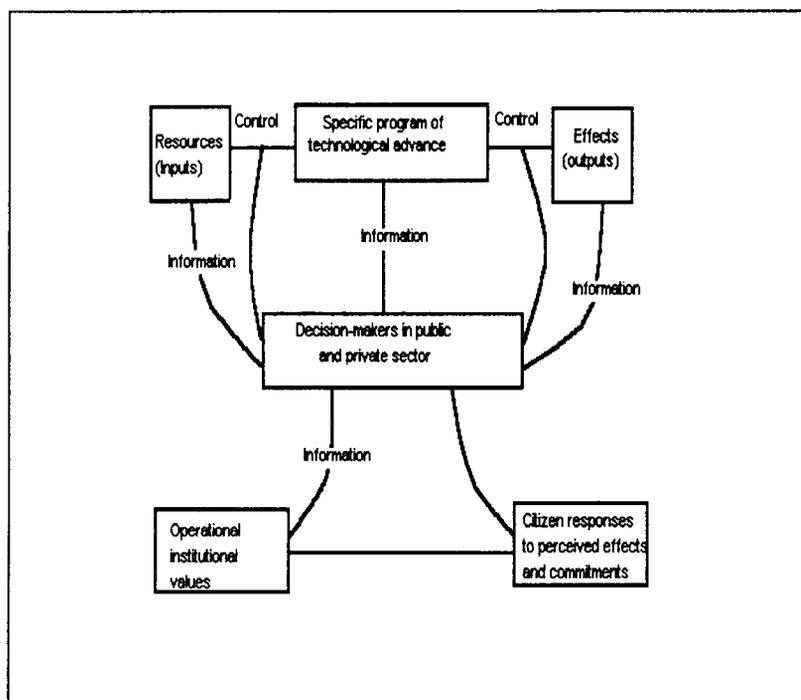


**Figure 9: The Engineering Model**

Source: Henry, Public Administration and Public Affairs, 1980, p.299.

**PARTICIPATIVE-BENEVOLENT MODEL:** Refining the engineering approach, there is the notion that technology can be viewed separately as a system into which there are inputs and from which there are outputs. Bridging the gap between inputs and outputs is some form of causal knowledge that once discovered would alleviate particularly social and other problems. This is the mode of thought

called the participative-benevolent model of politics (Straussman, 1978).



**Figure 10: The Participative-Benevolent Model**

**Source: Teich, Technology And Man's Future, 1977, p. 322.**

The players are the same as in the engineering model except that the expert never replaces the politician. Instead both participate in finding the most benign solution to a multitude of social and other problems. Problems are 'technicized' and thus individuals and their roles in resolving conflict become only symbolic and less substantive. The dynamic of this model is faith in progress toward a better society ( the good life) based on

progress toward better knowledge of causes and effects, devoid of personal bias. This is, if you will, the incremental application of piecemeal engineering (i.e. the incremental application of science and technology) (see Popper, 1950). An important implication of this mode of thought is that those who control scarce resources control a substantial amount of power (Straussman, 1978).

**TRANSITIONAL MODEL:** The transitional model recognizes the shortcomings of the previous model by acknowledging its reliance on imperfect knowledge. It recognizes that experts are not omniscient and thus are vulnerable to political activity. The expert's power is ameliorated by his/her ability to accurately predict the output (Straussman, 1978).

LaPorte and Abrams describe the dynamics of the transitional approach as being based on stability. They state that "stability flows from adequate causal knowledge about society. Planning thus becomes routine and ritualized. ...Econometric forecasting, technological forecasting and evaluation methodologies are perfected... and status and power become based on predictability" (Abrams and LaPorte, ed in Lindbergh, 1976).

The implications of this are that professionalism in politics and administration demands the rational use of expert knowledge that is reliable. Beyond this, rational policy requires refinement of cause and effect relationships. This implies that faith in the scientific method, inherent in both the models previously discussed, is no less central to understanding the mode of thought

represented by the transitional model. Technology is seen as the best hope for a more certain tomorrow.

#### **A SYNTHESIS:**

**GENERAL:** The facts to understand about the political modes of thought previously described are that technology is treated as a driving force within them. It initiates change and this change affects our expectations and further may cause unintended problems. In spite of these unforeseen problems, however, technology is still seen as offering the best promise of finding a lasting solution to our social condition (see Bella, 1978).

Our expectations, on the other hand, are necessary results of being human, irrespective of technology's influence. As such they cannot be technologically controlled, but only managed. The best hope for managing these aspirations is knowledge of ourselves and the application of that knowledge to technology decisions with the aim of finding the causes and effects underlying our existence for the good life. In Simon's words "...our hope lies in knowledge in understanding ourselves. Here, as with other problems, we are going to need more and better technology, not less" (Simon, 1973).

These facts define what we formally call 'politics' in a profound way. They allow for the unquestioned application of technologies for social reasons (i.e. social technology) (see Helmer, 1966) and define decision-making by rules (i.e. intellectual technology) versus intuitive or other human judgement (see Bell, 1989). This in turn defines politics as a residual or

intervening variable in rational choice. More specifically it argues that politics is antithetical to real knowledge and more importantly antithetical to technological progress. In Bell's words " politics in the sense that we understand it, is always prior to the rational, and often upsetting of the rational. ...Rationality as a means...for the efficient allocation of resources has been trusted beyond recognition ...Rationality as an end finds itself confronted by...the politics of interest and the politics of passion" (Bell, 1989).

**The Central Guidance Cluster:** Bertran Gross has conceived the relationship of politics in a policy-making context as consisting of a set of multiple interrelated, and often conflicting roles performed by various participants in what he described as 'the central guidance cluster'. Figure 11 on the next page shows this conceptual framework. The implications of this scheme are that, as Weber predicted, technocratic expertise is relegated either to a strictly guidance or strictly legitimization role in politics and political decision-making.

The question is, of course, whether or not this process of rationalized bureaucracy and decision-making has any relevance to valuing our existence for a good life. Rational choice, as we have described it, presumes the deliberate selection of exhaustively enumerated and valued good ends. In a political framework where technology serves not only to guide but also legitimize the party in power, real concern arises over the adequacy of such a bureaucracy to provide the fundamental freedom conceived in the

notion of "no-rule" in valuing any proposed R&D and new technologies (Straussman, 1978).

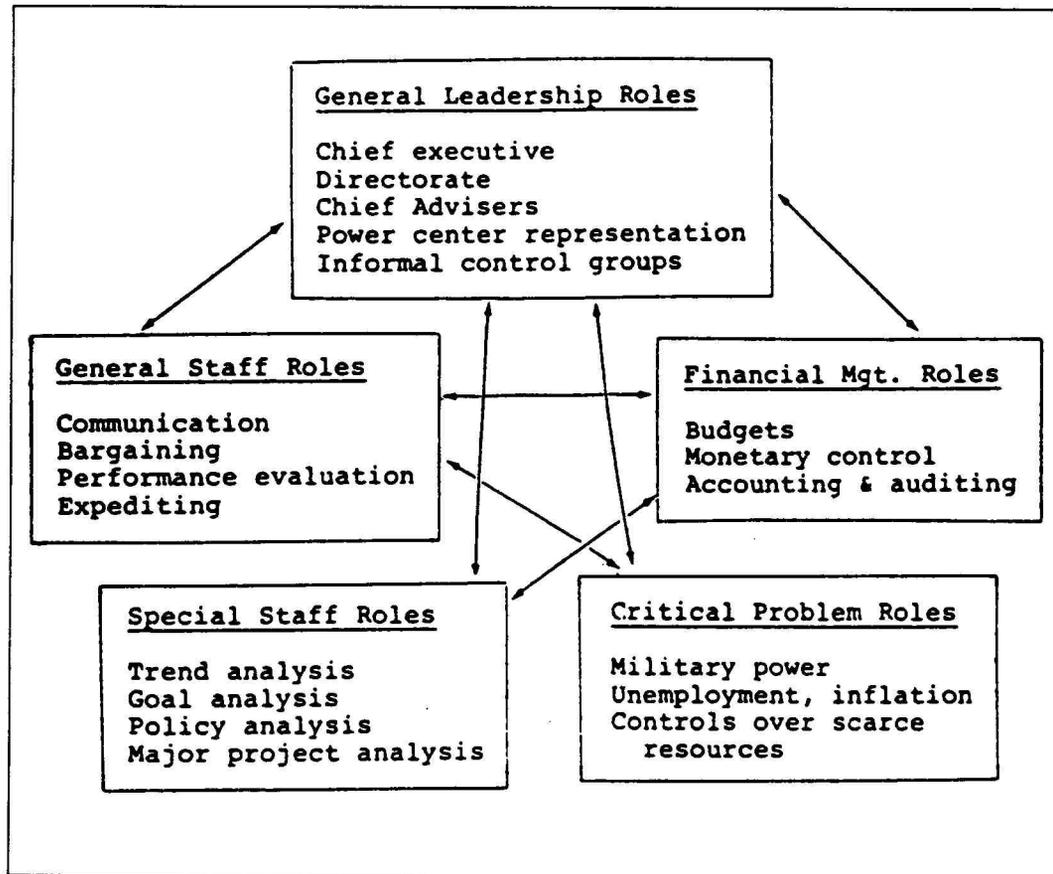


Figure 11: The Central Guidance Cluster

Source: Straussman, The Limits of Technocratic Politics, 1978, p.29.

#### UNDERSTANDING PUBLIC ADMINISTRATIVE MODELS:

**GENERAL:** Management science has played a major part in defining the various competing models of public administrative policy and decision making. These models can be characterized as

the executive, legislative and legal approaches. As a matter of clarifying terminology in the current literature, these models might also be described as the managerial, administrative and legal approaches. Regardless of semantics, there is agreement on at least four distinct public administrative policy and decision making schemes. \

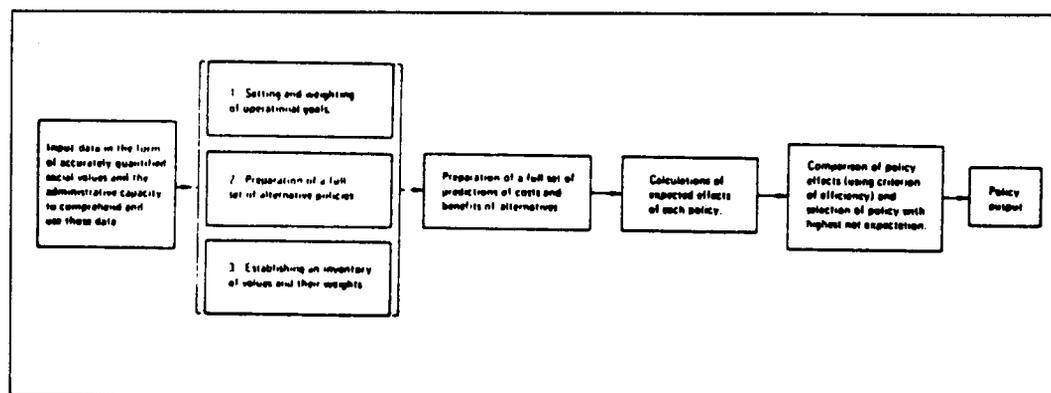
**RATIONAL-COMPREHENSIVE MODEL:** Traditional thought in the decision sciences has focused, primarily on rational approaches to policy and decision making. The "rational-comprehensive" model of public administrative policy and decision making can be described as the process of determining operational and measurable objectives , scrutinizing all possible means to accomplish these objectives, determining how to assess these means and choosing the best means to efficiently and effectively accomplish the task at hand (Rosenbloom, 1989 ; Stillman, 1976).

By various accounts the dynamics of this process are functionally related to several key factors that include: specialization which is required to reduce the various means considered; hierarchy which is required to reduce the set of values by which to assess the means; and merit which insures the decision maker is both informed and competent to make a rational choice, unencumbered by personal considerations (Stillman, 1976).

Each of these factors can be more fully developed, however, some distinctions should be made. The first of these is that specialization actually functions at various levels and encompasses not only the obvious aspects of compartmentalization of

bureaucratic structures but also the more subtle aspects of limiting the premises of agency assessments by constraining the use of expert jargon and the scope of inquiry. Another point is that specialization and hierarchy actually function in tandem to limit jurisdictional and managerial authority thus limiting the value set imposed on the lower level staff (Rosenbloom, 1989).

When these limiting factors are considered the "formal" rationality in the decision making process, as described in Max Weber's Essays on Sociology, takes place. In this context, discourse becomes a rational expression of deliberative and calculative virtue of action through an internally constrained dialogue with the outer appearances of efficiency and economy. Additionally, Weber's "substantive" rationality becomes operational through the merit of the decision maker to make choices that



**Figure 12: The Rational-Comprehensive Model**

Source: Henry, Public Administration and Public Affairs, 1980, p.90.

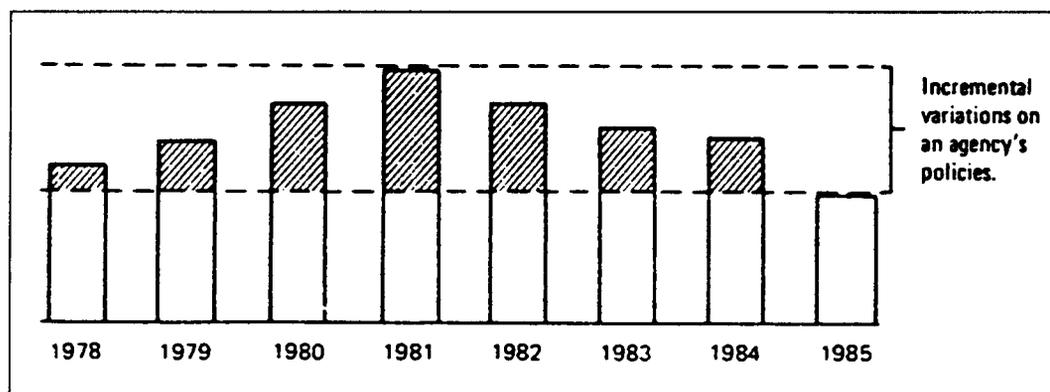
satisfy the requirements of common sense and intuition (thus appearing to be reasonable) (Bartlett, 1986). The Rational-Comprehensive model is shown on the previous page in figure 12.

Rational-comprehensive objectives are extremely difficult to identify where complex social and political action is concerned. Often competing ends are so complex that functional goals cannot be ascertained with any certainty and even if identified, are totally volatile in the context of a pluralized society. In fact, many authors argue that the "rational-comprehensive" model does not fit contemporary democratic policy and decision making, at all. These critics offer a second approach called the "incremental" model (Stillman, 1976).

**INCREMENTAL MODEL:** This model recognizes the ambiguity of goals and values in the selection of "rational-comprehensive" objectives. Vague goals and values are endemic to pluralism both in politics and social community and the price, moreover, for the consensus building required for its implementation. It strikes a compromise between the means/ends rhetoric of the rational-comprehensive approach. Where ends are not clear, discussion and action in the "incremental" model may well be a function of focusing on those means available to an agency to accomplish a task, irrespective of any particular outcome (Rosenbloom, 1989).

The implications of this approach are that, often, doing less for more cost is an acceptable outcome. Where the public interest is concerned, the relaxation of an end/means discourse results in a broad satisfying of competing interests by policy and action that

is more or less acceptable to the public at large. Analysis may become limited to a focus on opposition causes and/or decisions that are satisfactory or sufficient,



**Figure 13: The Incremental Model**

**Source: Henry, Public Administration and Public Affairs, 1980, p.90.**

versus decisions that demonstrate efficiency and economy. This kind of decision making is obviously more conservative, as the focus is on "not rocking the boat" and sticking to policy and action that has been successfully implemented in the past. Success is measured by plurality of support which must be accomplished through compromise and the maintenance of cooperation (Rosenbloom, 1989).

This model, too, has its limitations such as its bent for conservative action, its difficulty to reach and maintain a plural consensus, and its necessity to make small steps which are unpredictable in outcomes and which require constant back-tracking to adjust to a dynamic sequence of decisions. Probably the greatest

shortcoming is that it is ineffectual at setting and staying the course in long-range, large-scale ventures. As such it does not help accomplish leadership and visionary purpose of direction such as might be expected to occur in strategic planning and decision-making (Rosenbloom, 1989 ; Stillman, 1976).

**LEGAL MODEL:** The legal model of public administrative decision making is antithetical to the first two models in that it recognizes no particular ruling party. It relies instead on advocacy to assure that individuals, groups, corporations, and bureaucracies are not denied their rights or treated in an unfair or arbitrary manner by various decisions. It relies on adjudication according to some formal procedure which will ensure the identification of facts surrounding a decision, the interests of opposing parties, and the discovery of a balance between these opposing parties and the public interest. The aim of this mode of public administrative action is to develop some principles (i.e. much like legal precedence) which after numerous adjudications will define what decisions are appropriate or inappropriate regarding any particular policy or issue being decided (Rosenbloom, 1989).

Adjudication in the model takes on two basic forms which can be described as being either "prospective" or "retrospective" in nature. "Prospective" adjudication involves the regulating of activities (i.e. changing or modifying regulations or imposing new regulation) or granting licensing to businesses or new technology introductions. "Retrospective" adjudication involves dealing with complaints that someone's interests have been trespassed (i.e.

complaints of wrong doing, or injury or damages based on product or other liability). In either case a formal set of procedures is followed. Each interest presents its case to some regulatory or other quasi-legal commission and upon deliberation this body renders a judgement or refers the matter to an administrative court to decide the issue.

The pitfalls in this model have been variously described to include several points. One is that it results in a special form of incrementalism. This is to say that as numerous cases are adjudicated a body of principles are established, and this body of principles changes only slightly as time goes on. Because decisions in the model are incremental, they often make sense in their particular application but are unpredictable over time. Beside these criticisms, legal decision are obviously limited from outside participants and often can result in ambiguous decisions and/or decisions that cannot be uniformly applied to similar cases. Finally, the model is very time and cost intensive due to procedural requirements and the role of advocacy (lawyers) in representing the particular parties involved (Rosenbloom, 1989).

**MIXED-SCANNING MODEL:** The shortcomings of the previous three models lead authors to suggest a fourth model called the "mixed-scanning" approach. This approach essentially combines the strengths of the previous three models into a synthesized approach to policy and decision making. It requires decision makers to differentiate between fundamental decisions pertaining to long range goals and the more limited decisions that must be made to

satisfy interests in the context of these long-term goals. This model tends to define the difference between these decisions as being concerned with politics and administration, respectively. This is to say that political decisions are characterized as being involved with long-term goals, whereas administrative decisions are involved with the intermediate satisfying of interests to accomplish those goals.

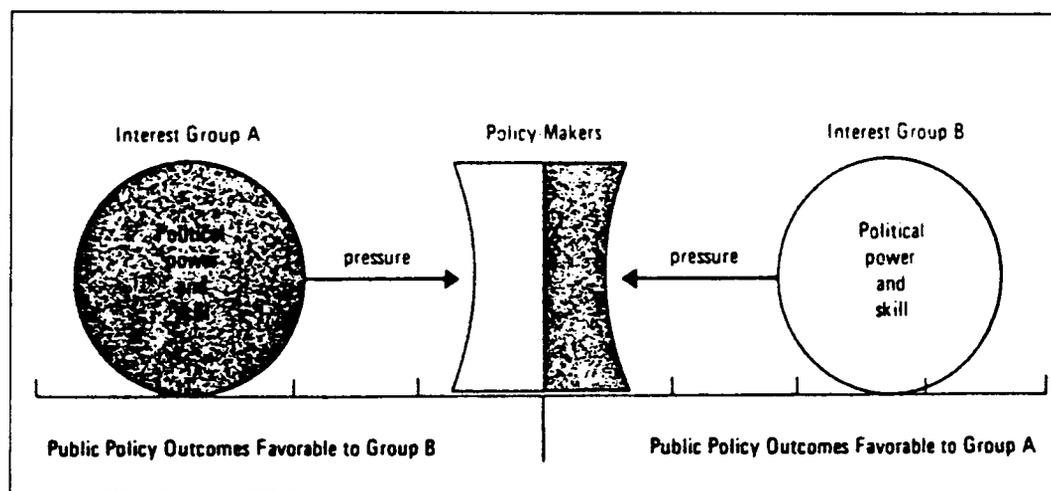
In this model several factors are deemed important to its successful implementation. One factor is the need to clarify goals. Where this is not accomplished ambiguity leads ultimately to confusion of ends and means in a philosophic sense. This in turn causes misplaced priorities. Another factor is avoiding the confusion of public interest with clientele group or constituency interest. Where this is not avoided decisions become coopted by powerful interests. Other factors are avoiding rigid conservatism which results in adhering strictly to rules and procedures when they have no value; specialization, which can cause oversimplification of problems; and finally overquantification which can cause the qualitative aspect of decisions to be deemphasized or overlooked (Rosenbloom, 1989).

#### **POLITICS/PUBLIC ADMINISTRATION AND GROUNDING REASONS:**

Where formal freedom is a state of "no-rule", grounding reasons are best characterized politically and public administratively as those that serve to illuminate the "public good". Arendt describes this good as the understanding that "...man

could liberate himself from necessity only through power over other men...", an understanding further extended to the recognition that "...no power is so absolute as that which a man yields over himself..." that "... wherever the man-made world does not become the scene for action and speech...the rise of a public realm-freedom has no worldly reality" (Arendt, 1985).

Conceptually this argues for the Weberian notion of a political and bureaucratic class which sustains the public realm in a manner that is supposedly neutral with regard to particular interests. The public good is found in the dialogue and public associations required in a viable public realm for a public good to actually exist. Henry shows such a conception in his depiction of the so called "group model" of public policy making in figure 14.



**Figure 14: Group Model of Public Policy Making**

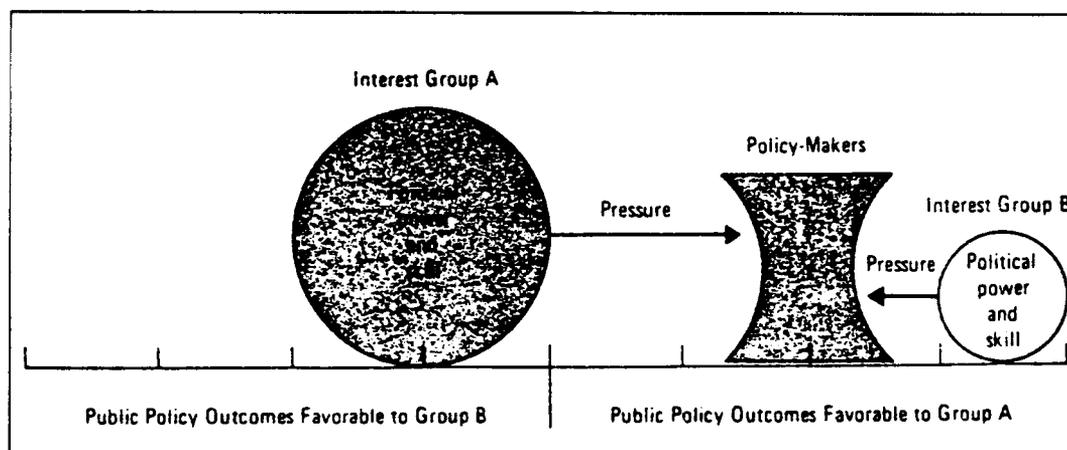
Source: Henry, Public Administration And Public Affairs, 1980, p.300

As this figure suggests politics and public administration are legitimate only in as much as they can promulgate rules and regulations that encourage interests to grow for good reasons yet exist for a good life. In a classical capitalist sense, government should not inhibit competition nor the free market, but rather broker competing interests in ways that promote the public realm. It should, on the other hand, insure that no interest is allowed to dominate the market place in a manner which allows its status to promote its own interests to the exclusion of all others. It could further promote this concept by promoting direct public dialogue in a manner similar to the experience of recent omnibus legislation efforts.

Politics and public administration thus conceived and operational is founded on rational choice which values the end not the particular means to that end. In such a conception, instrumentally valued ends should not be the focus of existing for a good life, nor will they at all necessarily be good, let alone necessary and sufficient as a reason to act. Arendt characterized this kind of politics and administration as rightfully suggestive of the fact that "we... measure the extent of freedom in any given community by the free scope it grants to apparently non-political activities, free economic enterprise or freedom of teaching, of religion, and of cultural and intellectual activities..." (Arendt, 1985).

### **POLITICS/PUBLIC ADMINISTRATION AND MOTIVATING REASONS:**

Where formal freedom is a state of "no-rule", in light of current public sentiment and activism, one questions whether motivating reasons can legitimately be sustained as a basis for political and public administrative decision making. Conceptually Henry has depicted the Group Model based on motivating reasons as shown in figure 15. The obvious difference between this model and the one previously shown in figure 14, is that politics and administration are influenced by powerful interests. Many studies argue that this model reflects the operation of numerous forms of western democratic governments, in which special interests control policy and decision making (see Lowi, 1971).



**Figure 15: Alternate group Model For Public Policy Making**

**Source: Henry, Public Administration and Public Affairs, 1980, p.300.**

Whether one believes these studies or not, politics and public administration based on motivating reasons would undeniably be tied up in the reality, for example, that "...regulatory agencies ultimately can be captured by the very groups that they are meant to regulate...". In this way then, "...their administrators, thus become increasingly unable to distinguish between policies that are beneficial to the public good...and those that are beneficial only to the interests of the groups being regulated" (Henry, 1980).

This is consistent with a description of motivating reasons as they have been previously defined. Any policy initiatives would be a reflection of particular interests that are compelling enough to be sufficient and necessary as reasons to act. This would be true irrespective of whether or not the resulting policies would have any value in a normative sense or were recognized or perceived valuable in any respect save only in the mind of the special interests being catered to.

#### **UNDERSTANDING POLITICAL/PUBLIC ADMINISTRATIVE REASONS:**

**GENERAL:** It has been reported that "every bureaucracy seeks to increase the superiority of its professionally informed by keeping their knowledge and intentions secret. Bureaucratic administration always tends to be an administration of secret sessions. In so far as it can, it seeks to hide its knowledge and actions from criticism" (Fairfax, 1978).

## POLITICAL/PUBLIC ADMINISTRATIVE TECHNOLOGY ASSESSMENT:

Figure 16 depicts our current system of technology assessment in political and public administrative settings. Of particular note in this framework is the implied reliance on predictive tools to properly assess the costs and benefits associated with any given technology. These predictions, importantly, assume that the various causes and effects of a given technology can be known or at least limited to some fixed set of descriptive variables.

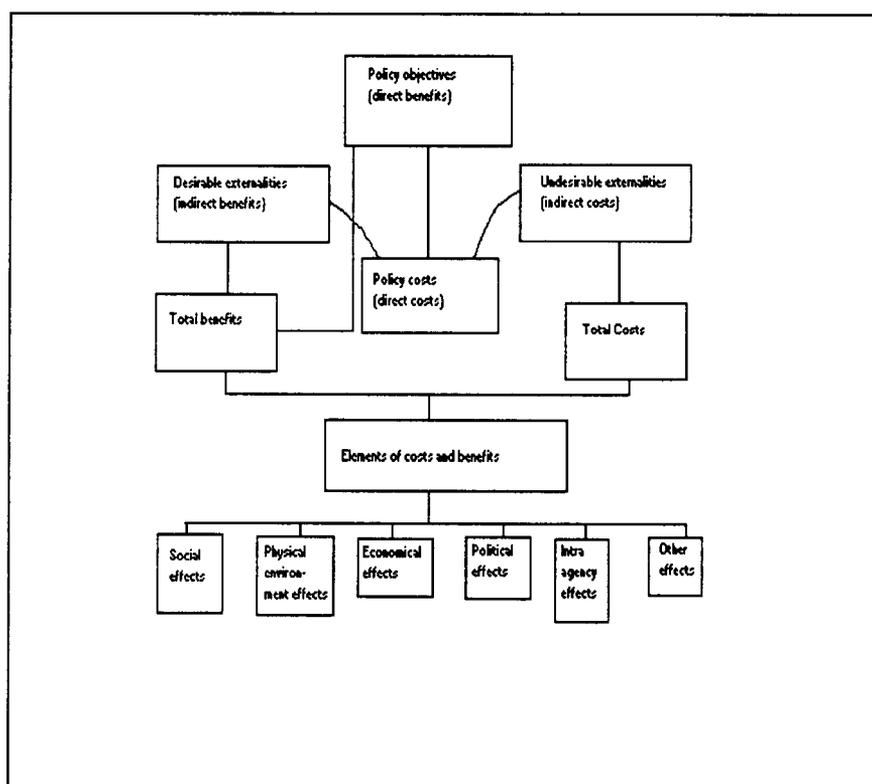
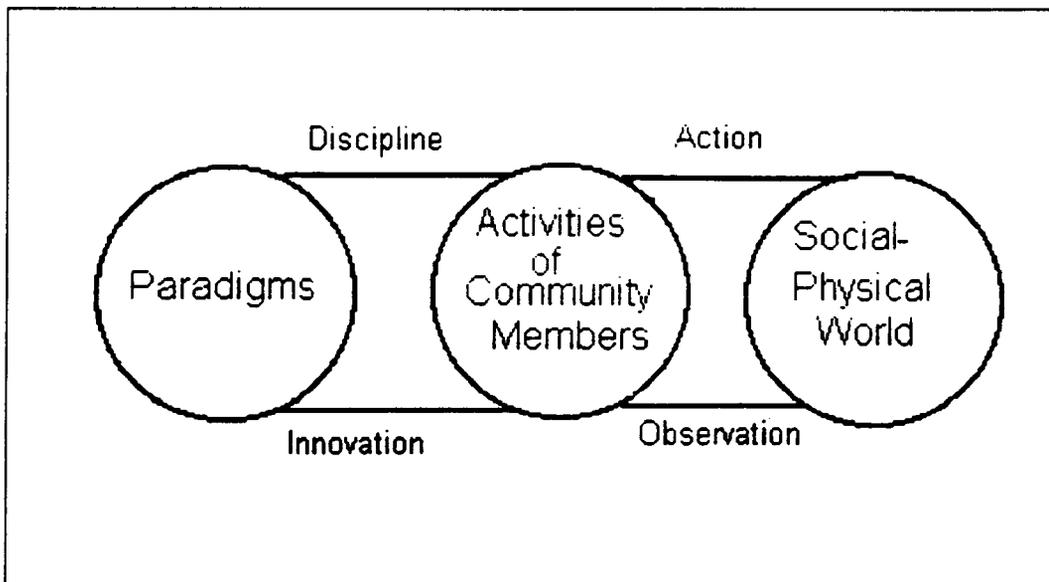


Figure 16: TECHNOLOGY ASSESSMENT STRUCTURE

Source: Henry, Public Administration and Public Affairs, 1980, p.313

This point merits some reiteration of Bella's explanation that all frameworks which purport to provide some technical evaluation of the environmental impact of various technologies are particularly burdened with biases associated with the discipline, actions, observations and innovations of their creators. Bella diagrams this criticism as shown in figure 17. His critique,



**Figure 17: DECISION MAKING GESTALT**

**Source: Bella, Technological Assessment, 1987, p. 123**

specifically, is that specialization in technical disciplines creates professional norms in actions, observations, language and achievement that are dictated by the prevailing scientific paradigms that control these specialties (see Kuhn, 1970). The predictions thus offered by these experts, must in some way conform with the reality created by their respective disciplines'

controlling paradigms. Otherwise their predictions will lack credibility in spite of their ability to produce so called "stable", consistent or otherwise reliable predictions.

In a subtle way, then, political and public administrative dialogue and action, which relies on these predictions for guidance and legitimacy, can be coopted by powerful internal as well as external political-economic, industrial and technical special interest groups. This reality coupled with the lack of openness inherent in hierarchical bureaucratic structures, makes the realization of a public good a very problematic proposition at best.

As an example of the dynamics of this problem in a political and public administrative context, it has been widely reported that the merger of the fledgling automobile industry with petroleum, rubber and steel interests and their financing by the country's largest commercial banks formed a political-economic interest group that dominated the political and bureaucratic processes of the country at the turn of the century. These interests promoted their profit motives through the systematic cooptation of the public transportation policy agenda. The result was the promotion of roads (the nation highway system) and restricted use of public lands (the closing of lands to railroad right-of-ways) (Bunting, 1972) and (Edwards, 1966).

The political and public administrative significance of this was that regulation was established at all levels (national to state to local) that removed the political struggle over

transportation from the public sphere to the forums of appointed, business oriented and technically staffed public utility and public service commissions at the state level. This insulated transportation decisions from public pressure by the de facto disenfranchisement of the urban population, which is now suffering the consequences of these actions, i.e. suffering with pollution, urban greenery and space problems and the lack of efficient alternative public transportation . Specifically, state level planning by appointed state level organizations whose very existence is tied to any particular technological fix substantially differs from direct public participation in the decisions of local councils and referenda.

**PARTICULAR MEANING:** "We are inclined to believe that freedom begins where politics ends, because we have seen that freedom has (generally) disappeared when political considerations overruled everything else..." (Arendt, 1985). Politically and public administratively, the notion of "no-rule" means that any action undertaken to be free in the sense of discovering the public good, must be "...neither under the guidance of our particular intellect nor under the dictate of our particular will..." but be undertaken, instead, based on "...principles that do not operate within ourselves as motives do...but inspire us from without... because they are much too general to prescribe particular goals..." (Arendt, 1985).

The bureaucracy of secrecy which Fairfax described is merely a manifestation of Bella's observations, a way of acting that is

burdened by the discipline, actions, observations and innovations associated particularly with career politicians and bureaucrats. The question to consider is whether or not action thus conceived is concerned with discovering the public good in any light save the "... shadows on the wall..." as described in Plato's allegory of the caves. Where political and public administrative bureaucracies and institutions have an interest in maintaining a particular status quo for their own survival and advantage the public good becomes subsumed in a particular means quite without a more proper focus on valued public ends.

**TECHNOLOGY, VALUE AND POLITICAL/PUBLIC ADMINISTRATIVE SETTINGS A REPRISÉ:**

In the context of political and public administrative settings, technology either serves the public good or it does not. Practically speaking, the evaluation of a particular technological fix lies not in the instrumental value of the end the fix is directed toward. Neither can it be appropriately determined by experts in any particular field nor the will of any other particular special interest group. It should lie, instead, in reflection of the human principles that transcend a technology's intended use and actual application. These are principles which are normative and not necessarily, specifically, related to the technology as either a particular desire or end.

It seems that the business of politics and public administration should be to ensure a forum to have these value-

principles discussed in the public realm. In this realm the public good can be discovered by discovering the needs and expectations of all interests concerned. This could work in forums much like local town hall meetings then broadened by Neilson polling or other telecommunications innovations. It is sure not to work within the context of bureaucratic secrecy or political dialogue that is coopted by special interests albeit economic, industrial, technical or other interests.

In this context, it would be each man's responsibility to "... yield power...over himself..." (Arendt, 1985) in pursuit of living for good and existing for a good life. Arguably such individual action should inevitably result, by nature or design, if we collectively enumerate and select normative values, then deliberate on them so as to choose to rationally act to achieve the most valued ends. In this formulation, technology, as Weber suggested, is incidental to the valuing process. It either serves a valued end or it does not in spite of its instrumental worth as the most efficient means to achieve a particular desire.

We have the power to do any damn fool thing we want to, and we seem to do it about every ten minutes.

Senator William Fulbright  
Time, February 4, 1952

#### VALUING TECHNOLOGY IN A PHILOSOPHIC CONTEXT

##### GENERAL:

Kant wrote that "...mankind as a whole shares a certain character in common... a moral character, or at least the makings of one. ...And this does not merely allow us to hope for human improvement... since even when this aim is recognized, the human race, for all its frailty, has a negative guarantee that it will progressively improve or at least that it will not be disturbed in its progress." (Kant, in Reiss , 1989). Ethics, in business, social, public and private life, is not a panacea for knowing a good, nor for understanding our existence for a good life. It is however a relevant first step in that direction which should not be simply ignored in rational decision making.

As Kant wrote, "...the passion or enthusiasm with which men embrace the cause of goodness... gives support for the assertion that... true action is always directed exclusively toward the ideal, particularly toward that which is purely moral (such as the concept of right)...".

This notion of right, Kant argued, "...cannot be coupled with selfish interests...nor overcome by pecuniary reward..". He continued "...there must be something moral which reason recognizes not only as pure, but also (because of its great epoch-making influence) as something to which the human soul manifestly acknowledges a duty" (Kant, in Reiss, 1989).

### **PHILOSOPHY, ETHICS AND VALUE:**

Philosophically, ethical conceptions are underpinned by at least four major schools of thought. These include: a natural, evolutionary philosophy, which sees technological progress as intrinsically good; a self realization philosophy that views individual interest as tantamount to all other modes of action (rational self); a utilitarian (economic utilitarian) philosophy that takes the greatest good position; and finally, an aesthetic philosophy which seeks justification of action based on purely artistic and emotional sensibilities. These four schools are not the only philosophical basis for ethical determinations, however, they do represent the more influential positions held by Western democracies today (White, 1991).

As relates to valuing ends it should be noted that these various schools of thought are quite heavily influenced by what Thomas Kuhn has called the "dominant scientific paradigm". In our present case this paradigm is "quantum physics", "quantum mechanics" and so called "new biology or

new ecology" as implied in the "deep ecology" movement. Previous to these paradigms atomistic materialism was the dominant paradigm (see Kuhn, 1957 and Naes, 1973).

Kuhn's point in relation to any scientific reality is that it relies, completely, on faith in the existing paradigm. Through that paradigm, science asserts a largely positivistic view of the world, which can, to a large degree, be empirically verified based on facts derived from the prevailing theory (paradigm). Things in the natural world that do not conform to a straight-forward interpretation and verification process based on the dominant paradigm are often explained away as being under observation or as being momentarily a mystery or lacking an appropriate basis for value (Kuhn, 1957).

**NATURAL PERSPECTIVE:** From the philosophical idea of natural evolution one is drawn into the basic Darwinian notion that somehow a great chain of life is evolving over time toward some biological end. In human organizational development this can frequently be seen in the attitudes of managers who espouse that progress means new projects that incorporate the latest, hopefully affordable, technology. The implication is that the process of technological improvement is both desirable and inevitable. With this interpretation, one can derive facts that support the claim that undertaking new projects or new technology is inevitable when viewed as future progress toward a more effective, efficient, and

aesthetically pleasing business, social or government organization (Sagoff, 1986).

**SELF-RATIONAL PERSPECTIVE:** The philosophic idea of individual self-realization offers as appropriate a dualistic determination of value by men who are apart from the world. Depending on who you might choose to read, this might take the form of Hume's relative ethics, or Kant's categorical imperative supplemented by a utilitarian formulation of value. The idea is dualistic in that it apriori sets men above nature capable to act through self-rational processes alone. This establishes values in man's own interest without regard to a universal or cosmic connection.

Substantively, this amounts to a distinction about the facts relevant to man's ability to value decisions from the context of the situation, from his perception of that context, or from his knowledge as derived from his theoretical hypothesis of what reality is. Somewhat more complex, this might also digress to a discussion based on phenomenology or the extreme positions of Nietzsche, Heidegger, Derrida and others who claim that there is no truthful claim to any system of value (Stone, 1988).

In all of these distinctions of fact, however, reason or rationality is used to define value, in the context of humans and an external world. This is fertile ground for Machiavelli's "Prince" or Plato's "Philosopher King". It is

quintessential man as a so-called self-proclaimed rational actor in the world (White, 1991).

**UTILITARIAN PERSPECTIVE:** Utilitarian philosophy is largely based on Bentham's proposition of the greatest good for the greatest number (Bentham, "The conquest of Pleasure" in Monson, 1963). This is the philosophy most familiar to scientists and the management and decision sciences. The focus is on value as an objective or subjective entity which is measurable (tangible) and which can be shown to have greater utility within the set of all other possible objective or subjective entities for any given decision domain. The desire of managers to justify their actions with utilitarian value assessments, coincidentally, bears a likeness to practicing the Aristotelian concept of calculative or deliberate intellectual virtue (Aristotle, "De Partibus Animalium and Politicus" in Guthrie, Volume 1, 1962). These valuations largely correspond with management's desire to support its actions, formally, with expert determined values (White, 1991).

Brown has pointed out that there are several common pitfalls with a strictly utilitarian approach to values: which options get included in any calculations?; what dimensions will these options be valued along?; what constitutes a good result and what constitutes a bad one?; and how long of a period does the valuation assessment cover (Brown, 1987)? Others point out, too, that economically

speaking, utilitarian schemes always assume that a value can be determined (e.g. How would you value pollution free air?) (Sagoff, 1985). Still others point out that there is no empirical evidence to suggest that increased benefits, especially monetary or material wealth beyond basic necessity, are necessarily positively correlated with happiness (Sagoff, 1985 ; Greer, 1989).

**AESTHETIC PERSPECTIVE:** Virtue or excellence of character is discussed by Plato in Phaedo and further developed through a discussion of the doctrine of forms in The Parmenides. In an aesthetic philosophic perspective, value is determined in much the same manner as knowledge of "true forms" in Plato's doctrine of forms or "first principles" in Aristotle's elaboration on Plato's theory of forms. Aesthetics taps into the idea that natural surroundings encourage and are quite appropriate to a sense of being part of the natural world (or the universe or the cosmos). The philosophical question pertaining to value is one of the virtue (morally) of sensing this oneness with Nature. This issue is not so much that a person possesses aesthetic form as much as it is a focus on the counter implication, that void of aesthetic form, can one have the presence of mind and spirit to appreciate the best in human beings (Paehlke, 1988).

**OTHER SIGNIFICANT VALUE CONCEPTIONS:**

**GENERAL:** Justice is another way to conceive of ethical values that deserves some attention. An important notion in Western democracies is the idea of equal justice. This is a concept that in general can be explained as dealing with the idea first presented by Aristotle in The Ethics. Aristotle framed the issue as follows:

"...Thus justice and equity coincide, and although both are good, equity is superior. What causes the difficulty is the fact that equity is just, but not what is legally just: it is a rectification of legal justice. The explanation of this is that all law is universal and there are some things about which it is not possible to pronounce rightly in general terms: therefore in cases where it is necessary to make a general pronouncement, but impossible to do so rightly, the law takes account of the majority of cases, though not unaware that in this way errors are made ...The law is none the less right... this is why equity... is not better than absolute justice only than the error due to generalization (of the law). ...The equitable man... is one who chooses and does equitable acts and is not unduly insistent upon his rights, but accepts less than his share, although he has the law on his side. Such a disposition is equity: it is a kind of justice, and not a distinct state of character..." (Aristotle, ed in Thompson, 1987).

The implication of justice as a way to understand valuing is that it provides for the possibility in technology decisions for otherwise profitable and legal options to be deliberately set aside on the basis that adoption of these technologies may not be an equitable act to humans.

**JUSTICE AS FAIRNESS:** This concept is further extended by Rawls, in his book, A Theory of Justice. Rawls offers a twist on the notion of social contract as developed and variously contributed to in the works of John Locke, Jean-Jacques Rousseau and Thomas Hobbes (see Locke and Rousseau ed in Steinberg, 1978 and Hobbes ed in Campbell, 1986). Rawls contends that the public interest can be implicitly discovered in most situations by applying "...two principles of justice..." : "...each person is to have an equal right to the most extensive liberty compatible with a similar liberty for others..." and "...social and economic inequalities are to be arranged so that they are both reasonably expected to be to everyone's advantage and attached to positions and offices open to all" (Rawls, 1971).

The implication of Rawls' view is that ethically, inequalities of wealth, authority and social opportunity are just only if they result in compensating benefits for everyone, and in particular for the least advantaged members of society. For technology valuations, Rawls' principles rule out justifying institutions and inventions based on the grounds that the hardships of some are offset by a greater

good in an aggregate sense. Such valuations may be expedient, according to Rawls, but they are not just because they implicitly sanction the notion that some should have less so that others may prosper. Rawls argues that his principles are simply a statement of the traditional Western concept of fairness.

#### **PHILOSOPHY, ETHICS AND GROUNDING REASONS:**

Aristotle argued in The Ethics that "...neither in moral nor in mathematical science is the knowledge of first principles reached by logical means: it is virtue, whether natural or acquired by habituation, that enables us to think rightly about the first principle..." (Aristotle, ed in Thompson, 1987). His point in this passage is central to understanding how we ought to act with regard to evaluating choices in our lives.

Virtue, the excellence in performing, lies not in reflection of what the intended end of our action is. Neither does it lie in what the end product of our action is. Nor does it lie in what the end product of our action becomes. It lies, instead, in accomplishing or performing what it is that we choose to do. In this sense the value of our choice transcends both reason and action.

For example, the value of a martyr's choice of a principled death lies neither in dying nor in reasoning not to live an unprincipled life. It lies instead in the

principle that leads to the choice. Likewise, the value of a society's choice to develop a technology that is economically practical and theoretically possible lies neither in the soundness of the theory nor in the instrumental worth of the economic activity it generates. It lies instead in the principles that underlie the technology chosen.

Grounding reasons that are ethical, are first principles, too general to be directly applied to specific knowledge about an end or the reasons associated with acts of practical necessity. Whether learned by our stock of stories about virtuous acts or by natural intuition, grounding reasons ensure that our choices are in pursuit of good and that our existence is for a good life.

#### **PHILOSOPHY, ETHICS AND MOTIVATING REASONS:**

With respect to motivating reasons, Aristotle suggests "...that while men are all agreed in doing homage to justice, and to the principle of proportionate equality, they fail to achieve it in practice. Democracy supposes an opinion that those who were equal in any one respect were equal absolutely in all respects. Oligarchy similarly supposes that those who are unequal in some one respect are altogether unequal. Acting on such opinions, the democrats proceed to claim an equal share of everything, on the grounds of their equality; the oligarchs proceed to press for more, on the grounds that

they are unequal- that is to say, more than equal..." (Aristotle, ed in Thompson, 1987).

Beyond opinion related reasons for choice, classical writing also recognized what Plato described as appetites or desires, which, too, could motivate action. Aristotle on desires described them as "incontinence" about which he wrote that "...nor does the incontinent man 'know' what is right in the sense of actively contemplating it; only as a person asleep or drunk can be said to know a thing. He act voluntarily (because in a sense he knows what he is doing and for what end), but he is not wicked because his choice is morally sound... he is not a criminal because he is not deliberately malicious; for he is not disposed to abide by the result of his deliberations and once excited does not deliberate at all ...Incontinent man is like a State which passes all the right decrees and has good laws, but makes no use of them" (Aristotle, ed in Thompson, 1987).

The point of Aristotle's arguments were to show that universal first principles are themselves opinions and often do not exactly conform to practical everyday situations. Practical necessity in life, however, requires us to immediately act based either on our unreasoned desires (incontinence) or our own unreasoned knowledge of first principles (continence). Continent action is no guarantee of right action since it is contingent on our understanding of the universal premiss. Incontinent action is not reasoned at

all but merely acted on once pleasure has been associated in our minds with making a particular choice. In either state of action, sufficient cause exists to make a choice and practical necessity demands that one act now, with or without deliberation. This explanation is consistent with previous descriptions of motivating reasons in this thesis as providing reasons for category 1, 2, or 3 acts. To be ethical, the action undertaken must be morally right. Morally right action can only be evaluated in deliberate reflection on the first principles involved with the act as was previously discussed regarding reasons for category 4 acts.

#### **UNDERSTANDING THE PHILOSOPHY OF HUMAN VALUING:**

**GENERAL:** Key to a philosophical understanding of the valuing of new technology is the importance of the concepts of quality of life and quality of the individual. In general, it has variously been postulated that the quality of the person is somehow directly, positively, linked to the quality of life that a person experiences. Previously, for instance, Maslow's need hierarchy was introduced as a behavioral science tool used by organizational managers to help them improve their coworkers' chances of achieving self-actualization, hence improved work output, after fulfilling various other basic needs. Likewise, the economic theory of maximizing human wants (see Bentham, ed in Monson, 1963) was

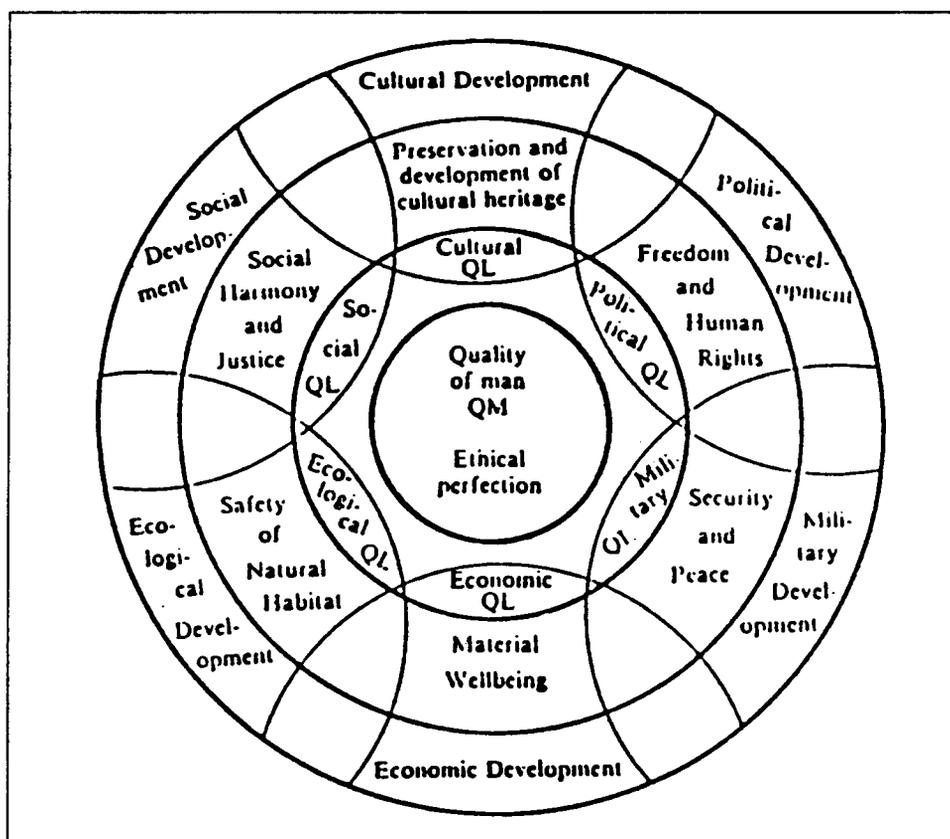
also introduced implying a similar human value in maximizing these wants.

**PERFECTING HUMANS:** The implication of these theories and their relation to quality of life is the proposition that achieving human perfection is at the heart of living to be good and existing for a good life. Historically, this proposition of achieving high quality people has either been attempted through a Hegelian path via coercion or a Hegelian path via freedom in Western societies. Neither path can claim any special success. However, with the recent demise of the former Soviet Union, the path of coercion appears to have been the greater failure of the two.

**QUALITY OF LIFE:** It is safe to say that quality of life is not easily separated from quality of the person. This is especially true since people, in effect, determine how society uses its organizations, power structures, natural and other resources, as well as, importantly, its science and technology. People also determine the purpose of these various factors. This is in contrast say to economic development which although it does help a person attain economic well-being, cannot be said to be more than one factor affecting human quality of life. Oleg Zinam has taken the various theories surrounding quality of life and depicted them as shown in figure 18 on the next page.

As a brief explanation, Zinam's concept of quality of life is composed of six basic areas affecting human

perfection. These areas have a strong relation to the needs represented in Maslow's hierarchy of needs. They include: the ecological- dealing with the safety of our natural environment; the economic- stressing human material well-being; the social- which is based on achieving social harmony and justice; the political- dealing with freedom,



**Figure 18: Quality of Life Concept**

Source: Zinam, American Journal of Economics and Sociology, 1989, p.56

human rights and dignity; and the cultural- involved with preserving and fostering the development of human culture and values (Zinam, 1989).

**QUALITY OF HUMANKIND:** Where the aim of a quality life is the moral perfection of humans, a connection can be made between quality of life and quality of humans. Figure 19 offers a functional scheme for this connection. It should be noted in this conception, that not all relationships are direct and positive, as was the generally

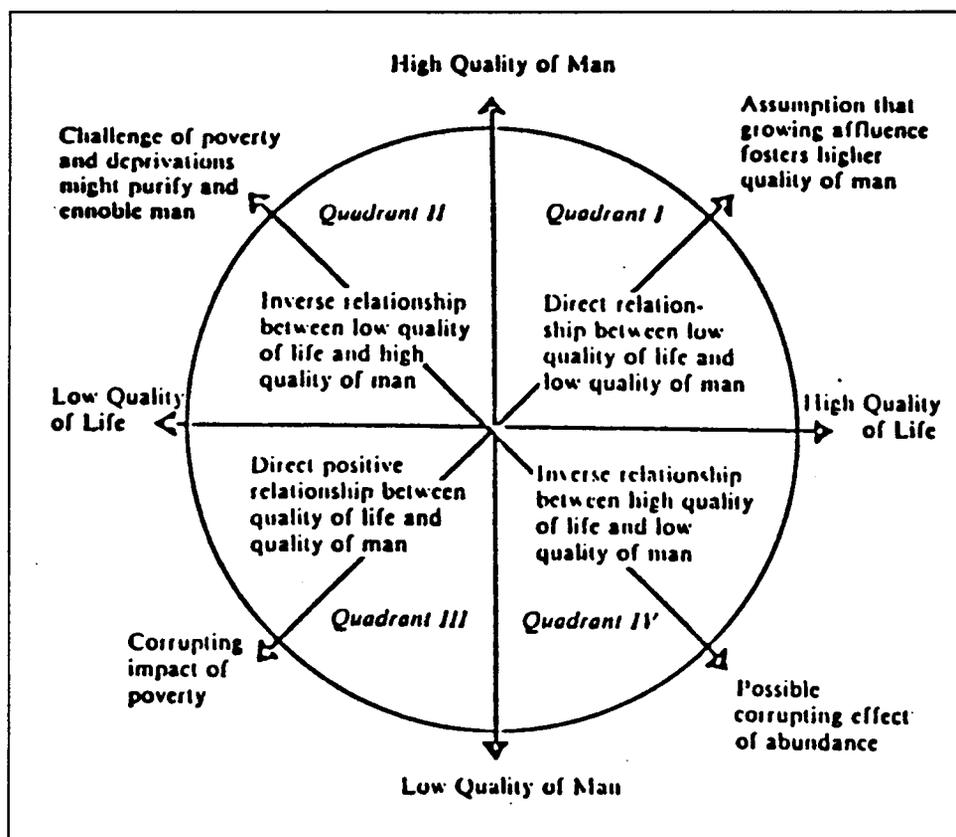


Figure 19: QUALITY OF MAN CONCEPT

Source: Zinam, American Journal of Economics and Sociology, 1989, p.58

accepted notion regarding quality of life and quality of man presented earlier. Zinam points out for instance that growing affluence and marked economic well-being can contribute to decay of the moral values of a society.

As an example he cites the contrast between the moral "decadence" seen as rising in highly industrialized Western societies and that in the oil-rich Arab countries where wealth is causing those societies to take extreme steps to prevent their cultural values, traditions, mores and customs from being destroyed (i.e. as evidenced by the growing resurgence of Muslim fundamentalism). Zinam's conception significantly challenges a direct positive functional relationship between the quality of life and the quality of man (Zinam, 1989).

**OPTIMAL QUALITY OF LIFE:** Optimality, suggests that where negative and positive relationships exist, more is not necessarily good. This is important, philosophically, as it should cause us to reflect on an issue that science variously casts as "sub-optimization" of organizations, power structures, natural resources, and science and technologies. The phenomenon being described is that it is possible that what may seem good for one part of an entity is not necessarily good for the entity as a whole. In business and engineering this is sometimes explained as the idea that "... what is good from a long range strategic planning perspective

is often as not poor from a tactical short range planning perspective (Riggs and West, 1986).

Optimal quality of life suggests that each individual has a stake in ensuring that the collective welfare of society is equal to the well-being of each individual. This is an ethical issue previously discussed by the classics as relating to "equity". Despite its scientific description, the moral significance of sub-optimization can not be hidden in cost\benefit ratios, nor the instrumental necessity to move in the market place before someone else does. As Rawls pointed out, previously, it is not equitable that some should profit at the expense of others, not, that is, without equitable compensation for their sacrifice.

What must be understood in the context of assessing the value of new technologies is that, traditionally, science, hence technology, has always claimed social or human neutrality. Where technology justification schemes largely exclude prohibitive social and other human costs due to the difficulty in determining these costs expediently or efficiently, it is little wonder that these schemes encourage investment on a particular practical level of necessity.

Politically and philosophically, this can be translated to a discussion of the operation of capitalism as an end or as a means to an end (see Adam Smith, The Theory of Moral Sentiments and Adam Smith, The Wealth of Nations). Where moral and ethical concerns are excluded from technology

assessment schemes, it is little wonder that we can end up with the capacity to destroy the planet, or eradicate the Earth's ozone layer, or the hundreds of other problems that have arisen out of our own choices to create technologies that have progressed to the point, now, of having a life of their own. It is little wonder, too, that the affluent few, who own these technologies are quick to litigate to remind us that the operant principle is still, " I have a right to make a profit" and "let the buyer beware", rejecting the more ethical proposition of "equity", as previously presented, by Aristotle.

**TECHNOLOGY, VALUE AND PHILOSOPHICAL AND ETHICAL SETTINGS A REPRISÉ:**

Where technology is concerned, there is little doubt that our lives are affected every day, by its discovery and application for human necessity. The question being raised in this thesis is not whether these technologies have any value, instrumentally, as an expedient, maybe even efficient, means to a desired end. Rather it is whether these technologies have normative value as an end justifiable in reflection of all other normatively valued ends. Additionally, the question is raised about how, in current justification methodology, "equity", is being incorporated into our decision making models. Finally the question is raised about how current methodologies recognize the sometimes positive and sometimes

negative relation between the human values in the quality of life and quality of human models. A synthesis of these concerns , it will be argued, is central to improving the way in which we currently value technological decisions.

For so it is, oh Lord my God, I measure  
it; but what it is that I measure I do  
not know.

Saint Augustine

### VALUING TECHNOLOGY, SOME OBSERVATIONS

#### GENERAL:

A wealth of literature makes it abundantly clear that our current techniques for evaluating new technologies are not at all foolproof. This is true in a business organizational, social, political, public administrative or philosophical context. Numerous examples of this deficiency can be cited in the business organizational literature (see Cook, 1986, Hill and Meredith, 1987 and Crawford, 1987), as well as the political and public administrative literature (see Straussman, 1978, Rivlin, 1989 and Biderman, 1966) and in the social and ethics journals too (see Naes, 1973 and Sagoff, 1986). This sampling of literature shows that economic justification schemes for valuing private and public projects are simply deficient in promising any reasonable guarantee of success either in the sense of our individual or collective economic well-being or in the more valuable sense of improving our quality of life and quality as mankind. These facts underscore the importance of the necessity to try to

improve these tools in order to make technology a less disaster-prone proposition for humans.

#### **UNDERSTANDING THE STANDARD METHODOLOGIES:**

**GENERAL:** There are several methodologies that are commonly used to evaluate the economic worth of projects. The three most common, are: the payback method (PB)- which gives the required time for returns from an investment to pay back the original amount invested; the net present value method (NPV)- which converts a set of cash flows over some time period into a single present value then selects investment opportunities based on positive evaluation for single projects or based on the maximum present value when comparing multiple opportunities ; and the internal rate of return method (IRR)- which provides a percentage that indicates the relative yield on any given use of investment capital such that where the return exceeds the cost of that capital, a project is worth investment (Randhawa and West, 1990).

**MORE COMPLEX:** Beyond these are other approaches that generally combine various formulations of costs and benefits together with management preferences to yield a more analytically complex but managerially appealing solution to valuation problems. These include: linear programming (LP), non-linear programming (NLP), integer programming (IP), goal programming (GP), analytical hierarchy processes (AHP), and other specialized mathematical techniques (e.g. Markov models

, utility theory, decision trees, and optimistic-pessimistic models) (Randhawa and West, 1990).

**BEST GUESSES:** Finally, where insufficient data exists to construct simple or complex formulations of costs and benefits, various strategic approaches are used. These might include value analysis (VA), scoring models (SM's), expert systems (ES), and Delphi or other expert best guess techniques can be used to justify R&D and new technology investments (Randhawa and West, 1990).

#### **A METHODOLOGY CRITIQUE:**

A couple of initial points are worth note. The first is that all of the schemes presented are totally instrumentally valued. This is to say that the expected cash flow in these methods is a reflection of real or predicted direct and indirect costs, real or predicted revenue, and real or predicted interest or "hurdle rates". Where these predictions are concerned, it can be argued that the expected cash flow, etc., is in truth never more than a subjective evaluation of worth. Where real costs, revenues and interest rates are concerned, evaluation with these techniques is retrospective and thus of little use in deciding future actions, except as a reactionary decision making tool. A second point is that these tools have not proven (i.e. have not empirically been shown) to be of great value, when based either on real or predicted values in decision making in complex

organizational, financial, environmental and social environments (see Keen, 1978; Kester, 1991; and Kester, 1992).

#### **SPECIFIC CRITIQUE OF THE COMMON METHODOLOGIES:**

Beyond the previous criticisms Meredith and Hill point out that the common techniques often use 'inflated' hurdle rates (thus arbitrarily eliminate many so called "less appealing" projects from an organization's list of consideration) which assume that everything else in the decision domain remains equal. This is a proposition that may or may not be true, if for instance, say, a major technological break through should occur or a new product or design is not introduced as anticipated in the preliminary evaluation. They likewise point out that often, not all relevant costs are included in an evaluation as for example when the introduction of a technology reduces one type of cost but unexpectedly increases or creates other costs (Meredith and Hill, 1987).

#### **PARTICULAR MEANING OF THE DECISION DOMAIN:**

With all of the methodologies described, a decision domain is presumed to exist. This means that a set of variables, some in the control of the decision maker and some not, are assumed to exist such that they are able to describe

the exact dimensions of any particular evaluation. Where all variables are knowable and controllable, decision making with certainty is said to be involved. Where the variables are mixed (i.e., some known and some not, and some controllable and some not) decisions are said to be made in relation to some risk. Where these variables are not knowable at all, decisions are said to be made with uncertainty (Meredith and Hill, 1987). In truth, where the first principles underlying all three kinds of decision making are not known, all decisions, even those represented as certain, are in fact both risky and uncertain (see DeMeza, 1989).

The implication of this is that particular knowledge in no way ameliorates anything but instrumental value. Even where statistical description and inference is used in attempting to quantify and identify the costs, benefits and risks associated with valuations made with these various methodologies, it is only ever a representation of a subjective entity that is only hypothesized in the experimenter's mind. The results of these evaluations, therefore, are never more than subjective in certainty of outcome or real value. Scientists and engineers often fail to understand this fact, or overlook and minimize its meaning in pursuit of their operative gestalt.

Engineering economic decisions often occur at the interface of technology and management, where engineered efficiency meet financial practicalities. Neglected in definitions of engineering is the sales function engineers use to convince users to implement their suggestions.

P.A. Samuelson  
Economics, p.3.

#### IMPROVING ON ACCEPTED METHODOLOGY: AN ALTERNATIVE VIEW

##### GENERAL:

In addressing how to improve the current methodologies used to make technology decisions, one approach might be to scrap these techniques altogether, given the previous chapters of this thesis. This approach could be justified on the grounds that none of the methods now used in any meaningful way incorporates normative values in its decision domain. This approach would never seriously be considered given Bella's observations and those of Kuhn regarding discipline gestalts and dominant scientific paradigms.

We will look in the remainder of this chapter, therefore, at some ways to try to ameliorate the observations regarding the valuing of technology previously addressed in the thesis given the fact that the current methods can not be totally disregarded. A first question to address is what to do about technologies that have previously been valued by

these methodologies? A second one is to look at what can be done within current methodology with regard to helping improve new technology assessment.

#### **AS TO EXISTING TECHNOLOGIES:**

With existing technologies, probably the greatest need is for these innovations to become better exposed in the public realm. This has been variously looked at by several authors in various organizational contexts. One such presentation is that of Adler and Helleloid, who point out that "... the greater the magnitude of technical change sought by a new technology (product, process, etc) the higher is the level of learning required inside and outside of an organization, for that technology to be effective." Another fact these authors point out is, that "...the higher the level of learning required, the greater will be the time necessary for people inside and outside of the organization to adjust to this learning." They depict these relations as shown in figure 20 on the next page (Adler and Helleloid, 1987).

A significant point that the authors propose is that technologies need to be better understood to become more effectively used for good or to enhance our existence for a good life. Traditionally, organizations (i.e. business, government, special private interests, etc.) have made little effort to educate their target audience on the significance

of their actions/offerings beyond the context of trying to identify a product or action with a practical need. This is a function of so-called "marketing" or "selling" one's particular product or service offering. By associating a product or service with a need motivation is aroused once that need is identified by the customer and the customer takes action.

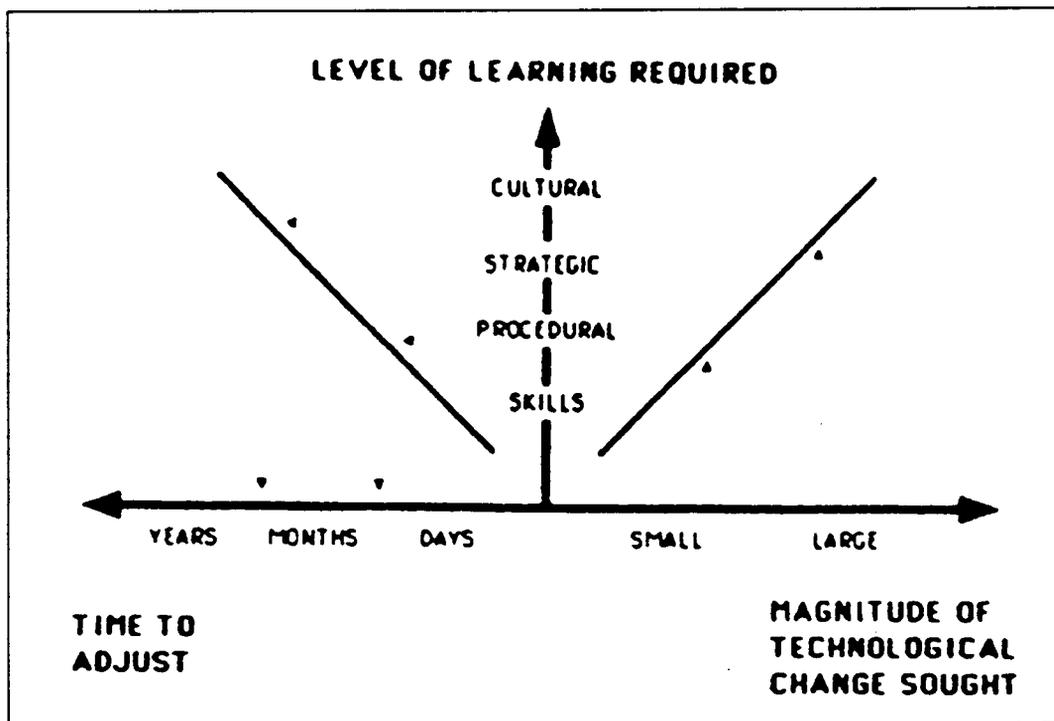


Figure 20: TECHNOLOGY ASSIMILATION

Source: Adler and Helleloid, IIE Transactions On Engineering Management, May 1987, p.103.

The authors suggest, that even in this narrow context, inventors, developers and promoters could be doing a better

job at explaining their activity. It can be argued, coincidentally, that these people, in fact, are in the best position with respect to knowledge of their own inventions to undertake this task. As matter of equity, in the course of their product and other promotional activity, organizations can and should assume more responsibility for educating the public about their product contributions to that public. In the process of educating the public on private and public offerings the makers could become better aware of the values underlying these offerings by explicitly being required to enumerate them.

A second improvement regarding existing technologies, obviously, is the need to require the periodic re-evaluation the technology in the light of the historical experience with its decision domain. This was alluded to as a fault of the common valuing methodologies, that often anticipated reductions in costs in respect to one area are diminished by new or increased costs in other areas. The practical meaning of this is that what made sense from an instrumentally valued perspective back then may not make sense now or tomorrow or the day after. In this regard it is cogent to note an often quoted conservative cliché that 'the price of freedom is eternal vigilance.' Those technologies that have not lived up to their billing should be eliminated. Those that have introduced unanticipated costs should be re-evaluated in relation to those costs.

**ON VALUING FUTURE TECHNOLOGIES:**

As a first step in improving current methodology, it is important that with regard to human normative values we develop a common language with which to address the human value of new technologies which appropriately compensates for the effects of professional jargon and gestalts. This idea was mentioned by Bond earlier in this thesis as a way to better determine normative value. The significance of this suggestion is its contribution to reducing the professional jargon (smoke) that surrounds any given problem domain. In many cases it will quickly lead us to the plain fact that Bella presents in his critique of technology assessment, that "...responsible management is based upon an honest recognition of our ignorance ...and our admission from the start that mistakes will occur" (Bella, 1978).

What is at issue here is the recognition that we need to avoid as many of the pitfalls of filtering and double filtering as we can (King and Bella, 1992). When we use tools, we should be precise about exactly what it is we purport to represent the variables and results of these tools to mean. It makes more sense, for instance, to acknowledge that subjective probability is more germane to appropriate risk assessment and prediction in most problem domains rather than the counter-representation that we have objective knowledge via descriptive and inferential statistics about events that we do not fully comprehend. By formulating a

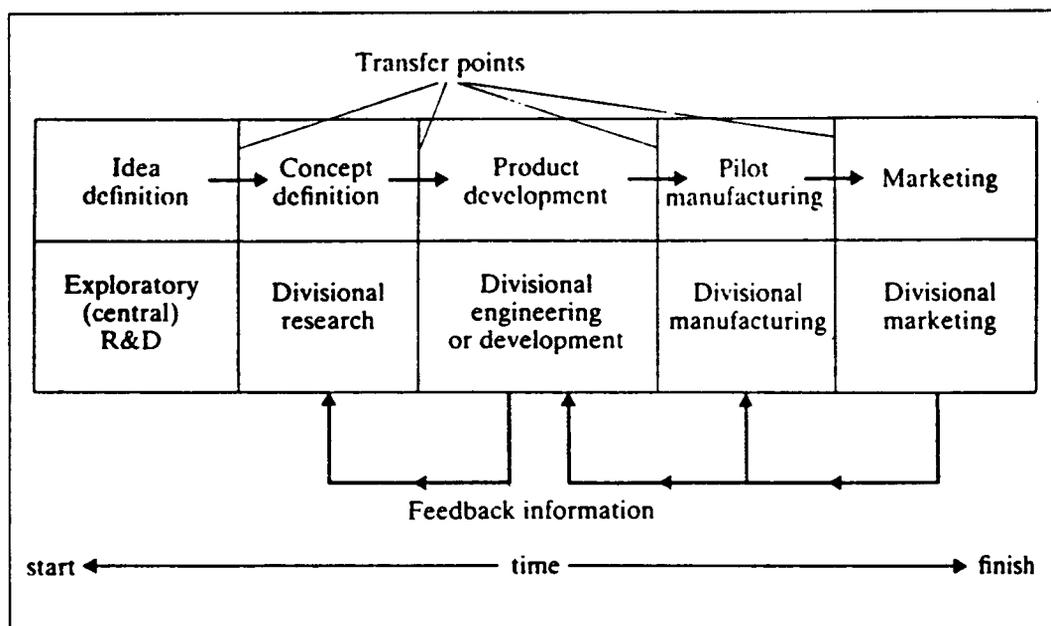
common human value language we could better insure that our models, measures and tools address the most important aspect of technology introductions, i.e., enumerating and valuing the principles that make the technology valuable to humankind as well as addressing the incidental issue of instrumental value as the most cost effective means to achieve those principles.

In a second important way, current methodology needs to recognize and focus on the linkages between ideas, organizations, and activities. Justification and or evaluation methods and tools for new technology should be tailored within the context of our discovering of a best way to innovate. Specifically, the appropriate evaluation tools need to be identified for the appropriate act. Little or no empirical research has been directed to this end (i.e. to determining which tools work best in which situations) from any perspective other than intuitive reflection (see Meredith and Hill, 1987 and Mills, 1985).

Meredith and Hill, for instance, suggested that the common methods work best for simple replacement decisions, while the programming models would appear more relevant for more complex and interrelated technologies in which some or a lot of historical or other data exists with which to build these models. They further stated that scoring models and other strategic methods like simulation are more appealing where total conditions of uncertainty exist, but they

acknowledge that no one has empirically confirmed this intuition (Meredith and Hill, 1987).

Shrivastava and Souder represent this notion in their writings on how to strategically manage technological innovations in business organizations. They depict the innovation process as shown in figure 21 below. Of note in this schema is the fact that innovation requires the integration, across an organization, of all aspects



**Figure 21: INNOVATION PROCESS MANAGEMENT**

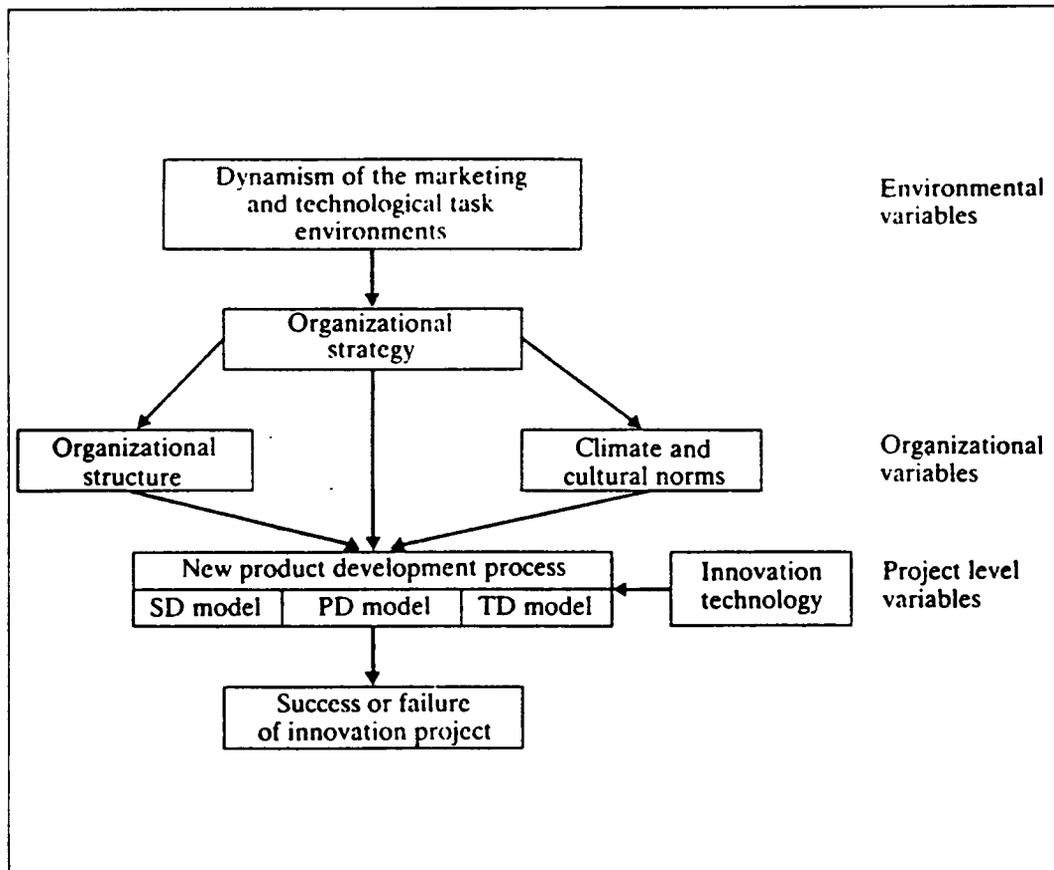
Source: Shrivastava and Souder, Journal of Management Studies, January 1987, p.34

relating to the transition of an idea into new proposed technology (Shrivastava and Souder, 1987).

These authors' research was based on field studies with over 200 new product innovations in 50 U.S. firms. They concluded that various management processes were required at each level of idea realization and especially at transfer points, if an idea was to be successfully implemented. They identified their transition strategies as various contingency models, relating them to whether the idea needed to be treated as a conceptual entity, a defined process or a mature task. The implication of their research is that evaluation at these transfer points should change, as Meredith and Hill likewise suggested in a different context, to develop a new technology from a concept to an actual application (Shrivastava and Souder, 1987). To improve our use of current methodology an effort should be made to identify which methods incorporating human values are most effective at identifying appropriate technologies albeit technologies at the pure research (idea) stage, applied research (concept) stage, or other stage of development.

A third important way that current methodologies can be improved is in respect to more fully developing the decision domain they are applied to. We note, for instance a representation of the traditional innovation model in figure 22 on the next page. In this representation, there are various environmental, organizational, and project level variables. Most of the methods used to evaluate technologies

focus on the last level of variable (i.e. those relating to a specific project).

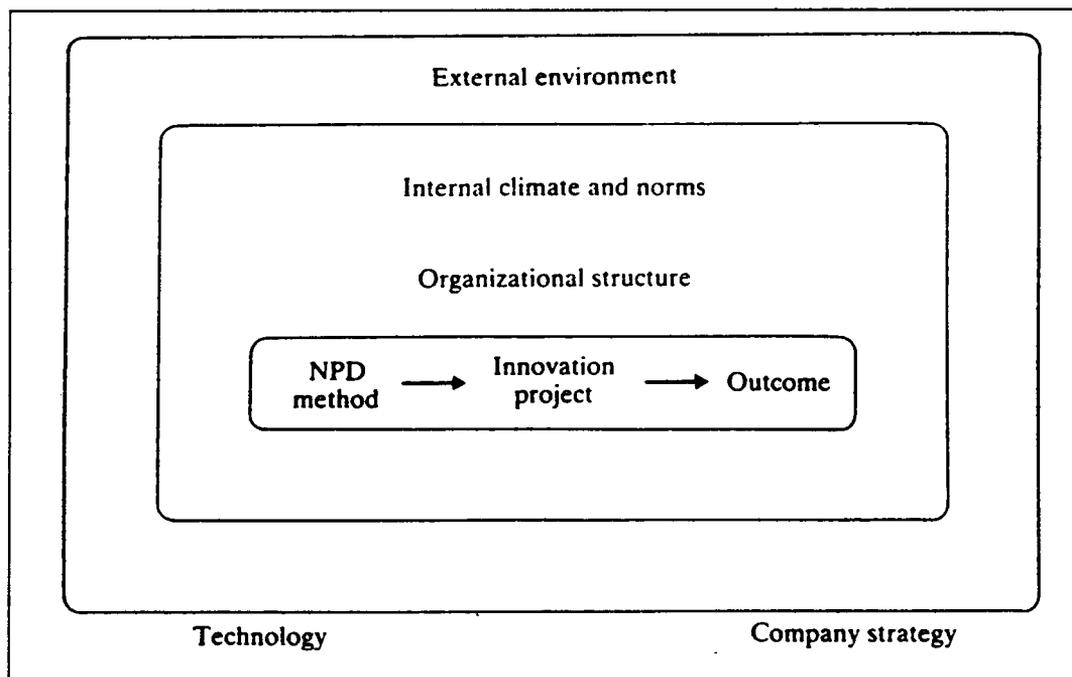


**Figure 22: Traditional Innovation Framework**

Source: Souder, Journal Of Management Studies, January 1986, p.45.

Strategic organizational management, in the last decade, has fostered a climate of understanding among managers and decision makers to start them to factor organizational variables into new technology justification schemes. However,

aside from a few large scale econometric models, little has been done to incorporate the level of variables identified as environmental into a majority of models represented by the traditional scheme previously depicted.



**Figure 23: CONTEXTUAL MODEL OF INNOVATION**

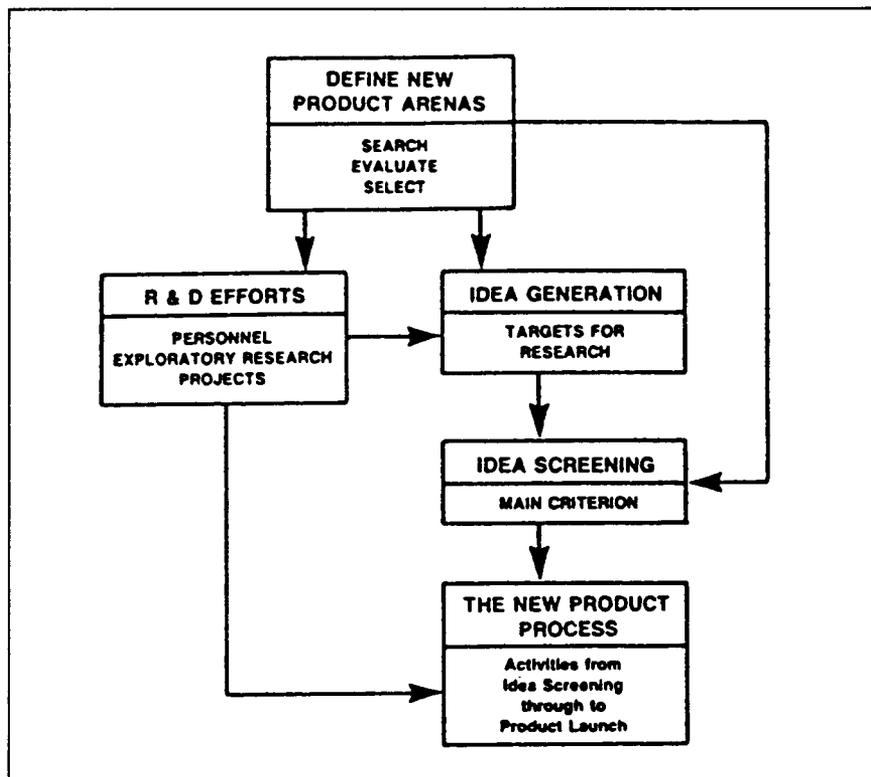
**Source: Perrow, Organizational Analysis, 1970, p.54.**

The implication is that, contextually, the methodologies presented, even if they were being used for the proper purpose, almost totally exclude instrumental valuing let alone normative valuing in the realm of an organization's external environment. This is primarily due to the "uncertainty" which the prevailing management gestalt states

to exist with regard to decision variables in this domain. Figure 23 on the previous page depicts this situation. An obvious further implication is that organizations could attempt to make their justification models accommodate external variables. In this manner, normative human values and or social and other costs would carry an appropriate weight in making current technology decisions. Even if these costs are in fact totally uncertain, as the prevailing management gestalt suggests, a subjective 'stab in the dark' at these variables is more logically consistent with reality than their current widespread exclusion. Additionally, without their inclusion in current methodologies, it is doubtful whether any explicit research will be undertaken to test the hypothesis that these are uncertain variables.

#### **EFFECTIVE PRE-SCREENING:**

Literature has reported that effective technology introductions require organizations to be selective in choosing the arenas they enter into. This research explains the critical need in arena selection to assess fully the "... need, growth, size and technical possibilities in each potential arena ... before committing to evaluate the technological feasibility..." of any venture (Cooper, 1987). Figure 24 on the next page below exemplifies the thrust of this literature and demonstrates that arena pre-screening



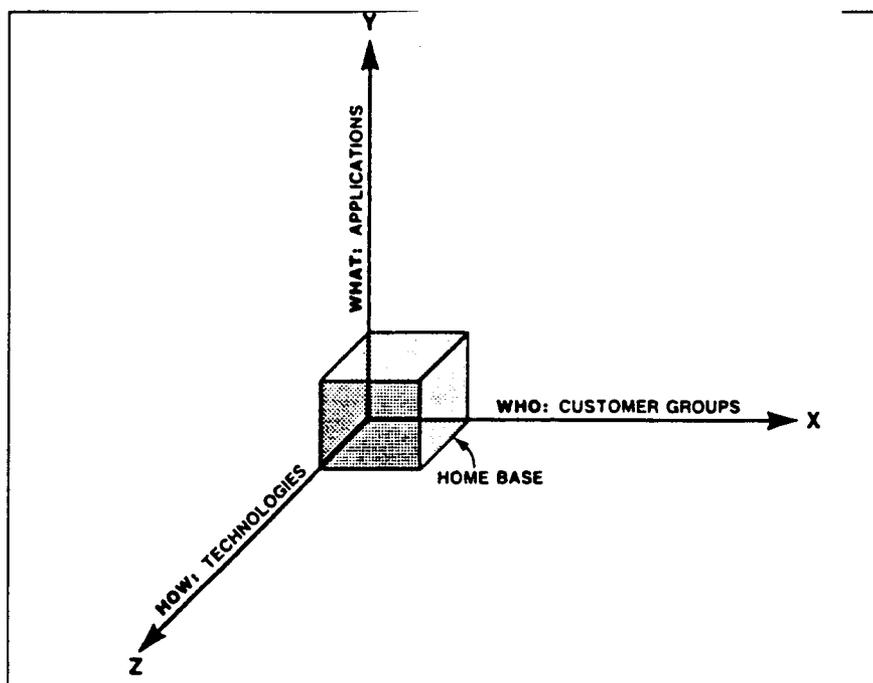
**Figure 24: Importance of Arena Selection**

**Source: Cooper, IIE Transaction On Engineering Management, August 1987, p. 186.**

should drive new product or other new technology venture strategies. The essence of pre-screening is to focus the application of the various evaluation methodologies only on specific technologies that compliment an organizations abilities rather than on any technology that differentiates an organizations in the market place.

In a larger sense this is the appropriate manner for humans to effect the setting of terms for "no rule" as pertains to the activities of organizations and government.

Pre-screening technologies forces one to enumerate the possibilities before expending resources. By defining proper arenas we are more apt to see that technology introductions are the multi-dimensional problem as shown in figure 25 below. Relating these dimensions to our individual and collective abilities could help us place



**Figure 25: Multi-Dimensional Aspects of Arena Selection**

**Source: Cooper, IIE Transactions on Engineering Management, August 1987, p. 191.**

limits on idea generation, new products/projects, and technologies by identifying a human home base and explicitly identifying the who, what and how that constitute the sources

**Table 9: Technological Commitments**

- 
1. We should only alter or control our physical world for useful purposes. Benefits usually should be measured in economic terms.
  2. Complex problems must be broken down into their basic parts. The behavior and properties of each part should be methodically and exhaustively examined.
  3. All explanations, descriptions, goals, problems and solutions should be defined in a totally understandable and unambiguous manner.
  4. Plans specifications and procedures should be carefully defined and explained prior to the initiation of any project or investigation.
  5. Explanations, problems, solutions and descriptions must be approached objectively and subjectivity avoided where possible.
  6. Theories, laws, explanations and the likes must conform with reliable sense based observations of real world behavior (i.e., be knowable by sight, touch, hearing, taste or smell).
  7. Time should be considered as continual as a sequence of instants representable by numbers. It should be viewed as uniform, constant, and uninfluenced by events.
- 

**Source: Bella, Engineering Experiment Station Bulletin, No. 53, 1977, p. 24.**

of new technology application and planning (Cooper, 1987 ; Blunden, 1984). In this way the public good could be enumerated and special interests prevented from advancing their interests at the public's expense. The secrecy of

bureaucratic agencies could also be overcome, where general principles were enumerated and formally required to be deliberated upon.

Bella suggests that various technological commitments are a good way to properly identify appropriate arenas of interest. These commitments were listed in table 9 on the previous page. Bella sees these commitments as the essential outline for the general principles required by humans for responsible decision making regarding any new proposed technological investigation or application. These commitments could form the basis for a coherent human home base with regard to any new technology offerings. Where they were formally adopted by the government and its administrators, they could serve as the basis for the Office of Technology Assessment or Transfer or other agency decisions on new technology research and development. These commitments might further be augmented through public forums to include other normative human values. In fact Bella, himself, augments his own technological commitment list by what he calls the five fundamental commitments regarding assessing the impact of new technology arenas. These are shown in table 10 on the next page. The thrust of these fundamental commitments is to overcome and temper the expert gestalt previously described. By following these fundamental commitments Bella argues that science can be allowed a role in investigating future technologies, but

Table 10: Five Fundamental Commitments

COMMITMENT	DESCRIPTION
Have the capacity to correct mistakes.	Technology choices should protect future generations capacity to correct the unforeseen outcomes of current actions.
Allow some freedom for mistakes.	Technology choices must always protect the ecosystem and its diversity so that it can be resilient enough to compensate for mistakes.
Keep the capacity for choice.	Decisions, actions and policies should protect the existence of the widest variety of habitats, species and resources.
Maintain freedom of choice.	Avoid last minute fixes and/or technologies that require more complicated technologies to maintain and control their future application.
Maintain the ability to learn.	Focus technology decisions on the necessity to responsibly explore new ideas, readily identify and admit mistakes and avoid trying to fix blame or fault.

Source: Bella, OSU Water Resources Research Institute Report, No. 57, 1978, p. 14.

technologies, but only in a safe domain, as concerns the public (Bella, 1987).

**Table 11: Technology Impact Assessment**

step 1	<p>define the assessment task</p> <p>discuss relevant issues and any major problems establish scope (breadth and depth) of inquiry develop project ground rules</p>
step 2	<p>describe relevant technologies</p> <p>describe major technology being assessed describe other technologies supporting the major technology describe technologies competitive to the major and supporting technologies</p>
step 3	<p>develop state-of-society assumptions</p> <p>identify and describe major nontechnological factors influencing the application of the relevant technologies</p>
step 4	<p>identify impact areas</p> <p>ascertain those societal characteristics that will be most influenced by the application of the assessed technology</p>
step 5	<p>make preliminary impact analysis</p> <p>trace and integrate the process by which the assessed technology makes its societal influence felt</p>
step 6	<p>identify possible action options</p> <p>develop and analyze various programs for obtaining maximum public advantage from the assessed technologies</p>
step 7	<p>complete impact analysis</p> <p>analyze the degree to which each action option would alter the specific societal impacts of the assessed technology discussed in step 5</p>

Source: Tiech, Technology and Man's Future, 1977, p. 260.

Tiech presents the pre-screening problem in the light of the National Environmental Protection Act of 1969, as essentially consisting of the process of preparing and evaluating environmental impact statements. This process, as

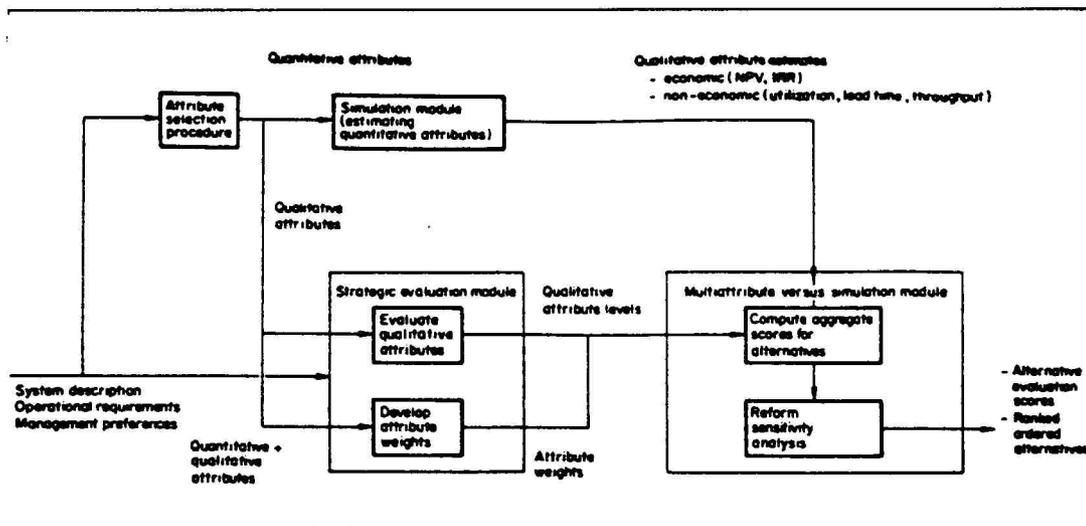
pertains to most technologies, can be defined by the seven steps as shown in table 11 on the previous page.

The point to make whichever author's conception one uses, however, is that arena screening should be accomplished before any of the justification techniques presented in this thesis is used, not after. This is because screening will help us to better define the problem and decision domain and their respective variables. This will mean better facts about our modes of thought will be achieved resulting in more clearly defined benefits, costs, and alternatives. This in turn will result in exhaustive enumeration of the potential normative value of any intended action (Tiech, 1977).

#### **ON STRATEGIC APPROACHES:**

With new technology little is known about the actual decision domain. This was one reason previously cited for using best guess strategic valuation approaches where complex, inter-related justification decisions had to be made. The plain facts are that justifications in this arena are nearly always represented with random variables for costs, benefits and the likes. Additionally since no historical data usually exists or the data that does can not be reliably extrapolated into long planning horizons, often, a manager's best guesses are used to define the decision domain.

None of the strategic methodologies previously presented can provide a panacea for complex, inter-related justification decisions. The current strategic techniques, however, are generally applied to technology decisions separately based on the circumstances surrounding their cost and efficiency in providing a decision. West and Randhawa, in contrast, offer an integrated strategic



**Figure 26:New Strategic Methodology**

**Source: West & Randhawa, Computer Integrated Manufacturing Systems, November 1992, p.277.**

methodology which incorporates all of the common strategic valuation techniques into one evaluation tool, for use in complex manufacturing investment evaluations.

Figure 26 on the previous page shows their concept which integrates a computer simulation module with a management

judgement component and multi-attribute scoring component to make complex inter-related investment decisions. The authors justify their proposed scheme on the basis that it allows for the integration of economic considerations, with subjective management preferences, that are both operationally (quantitatively) and qualitatively derived, yet computationally easy to evaluate (West and Randhawa, 1992).

In this scheme a computer simulation component is used to deal with the complex and inter-related variables of the decision domain, due to its ability to accommodate large numbers of decision variables and crunch both soft and hard numbers to arrive at a solution. The results of this component are passed to a strategic component where a management module can be used to assign arbitrary values and weights to decision alternatives. These individual attribute values and weights are then synthesized using a linear additive model which can be easily evaluated for sensitivity by standard analytical techniques (West and Randhawa, 1992).

The advantage of this methodology over current ones in use is that it integrates all known methodologies into one. This allows for the evaluation of both hard and soft numbers regarding any particular assessment. In contrast to the manner in which the current individual methods are now used, this provides flexibility to express normative values which heretofore have not been considered in an explicit manner. This concept of integrating strategic approaches and

incorporating "soft" variables is only now emerging in literature regarding new technology decisions, identified as so-called "Soft Systems Methodology" (see Senge, 1990 and Checkland and Scholes 1990).

As Checkland and Scholes relate in their book Soft Systems Methodology in Action, "...the overall aim of Soft Systems methodology is to take seriously the subjectivity which is the crucial characteristic of human affairs and to treat this subjectivity, if not exactly scientifically, at least in a way characterized by intellectual rigor...". This idea is further supported by Senge in his book The Fifth Discipline: The Art and Practice of the Learning Organization, who reports that "...the impact on manager's understanding of mental models is profound -- most report that they see for the first time in their lives that all we ever have are assumptions, never "truths", that we always see the world through our mental models and that these models are always incomplete...".

If a man takes no thought about what is distant, he will find sorrow near at hand.

Confucius

## VALUING NEW TECHNOLOGY A CALL FOR REASSESSMENT

### CONCLUSIONS:

J. Naisbitt, in Megatrends, made the point that "...as computers have become more accessible and powerful, more problems have been exposed to analysis and the results have been better." In this thesis an integrated strategic valuation methodology was offered as a means better to approach the problem of justifying new technologies. A computer simulation component was a key aspect of that methodology. Yet each methodology, it has been pointed out, has its own hidden set of values. The methodology presented is, therefore, no exception and was designed to address the problem of justifying new automated manufacturing systems. It thus cannot be used with reckless abandon on any technology without careful regard to the "hard" and "soft" variables included or excluded from its decision modules. Neither can it on its own resolve what weight should or should not be placed on the management preferences explicitly enumerated in the management component. It can however accommodate these variables and weights in a complex and compound manner and

crunch the numbers and rank order various alternative technology decisions. Without pragmatic experimentation with new technology decisions it is fair to say that it has not been demonstrated to be totally generalizable to all new technologies. It does, however, recognize the importance of integrating the current strategic techniques to assimilate the advantages of each into one overall methodology.

In the process it also addresses some key points about the meaning of the facts and modes associated with valuing future technological improvements. For example, where it recognizes management preferences as key to justifying a decision, it is by implication stating that guessing the future is never better than a 50 - 50 proposition, and that we often value arbitrarily those things that we desire most. In this respect the methodology is at least consistent with the meaning of modern decision making in uncertain conditions, as is characteristic of new technology research and development decisions.

It can also be noted with respect to the strategic methodology offered, that by using the mode of computer simulation one is embracing the hidden message that "more" not "less" is acceptable in describing the problem and decision domain ( i.e., current modes of justification emphasize the use of simplifying assumptions and reduced problem variable and decision domains). Simulation likewise implies the use of random variables, which in turn more

precisely describe the real world which is unpredictable (random) more often than not.

Further it could be pointed out that the methodology presented uses both economic and qualitative factors to make a decision. This would provide us with a way to recognize the concept of negative human value in the quality of life theory previously presented. It emphasizes, for instance that economic well being is only one of many factors affecting human quality of life that must be balanced against all competing values.

Without the recognition that the facts and modes of our technology decisions are distorted by our current faith in science, we are at least susceptible to permanent extinction. This should provide us with a clear enough incentive to consider the proposition that grounding rather than motivating reason ought to guide our deliberative judgements and processes. Where freedom is a state, wherein we may do as we please, our business, social and political lives are concomitantly tied to our ability to achieve 'isonomia' in the public realm. This requires that we individually adopt a proposition of 'equity' for the sake of being good and to exist for a good life.

How this relates to our improving the way we value new technology is a function of the ultimate union of public and private interests in a business, social, political and public administrative context. The preferences of competing special

interests could easily be identified and valued and their respective attribute weights determined in a public forum as opposed to privately, as the ones have been in the methodology proposed that were assigned by professional managers. In this sense, these values and weights would then reflect a collective-rational basis for progress or action. This would be a more appropriate way to assess new technology than is now commonly practiced. It would, for example, allow for a full public discussion of, say, nuclear versus solar energy, in a manner that not only recognized the value to a company of making money, but also to the public in providing a safe environment for future generations.

Key to providing for such a forum is the adoption by all interests of that justice Aristotle called "equity". Not unlike Weber's work ethic, "equity" could provide a motivation in capitalist societies for more benign forms of profit generating economic synergies. In these types of ventures wealth maximization (i.e. profit maximization) might be less desirable from a human value standpoint than say the maximization of operating revenue. In this manner the important capital consideration in a business, for example, would be the preservation of a means to work and not the markers received for that work. Obviously, the markers would have no real human value beyond providing for basic necessities. In such a conception too workers and managers

could both still be recognized for their contributions to the company and rewarded too.

The company providing human society with a place to work, however, would be providing a human artifice which could embody the principle of Weber's ethic (i.e. an honest days work for an honest living) while at the same time providing more profound principles like the excellence in craftsmanship described by Pirsig in Zen and the Art of Motorcycle Maintenance. These principles could easily supplant the almighty dollar as being more valuable from a normative human sense. They might also provide a more sane basis for undertaking any new technology proposed where profit maximization has already been shown to be a disaster-prone proposition.

Organizationally 'equity' demands that a more benign concept of capitalist venture evolves, one that emphasizes the human values associated with perpetuating people, not particular organizational interests. The current trends toward the HRM model in business management is a step in the right direction, as it does focus on empowering people to lead more productive and creative lives, much like the 'arete' espoused by the classics. Its deficiency lies in its misguided premiss of corporate values that exclude more basic human values (i.e. human quality of man) as the organization's central premiss. Our pre-occupation with formulations for optimal wealth maximization, devoid of the

recognition of the negative human value of wealth beyond the classical conception of 'necessity' is at the heart of what prevents "equity" from guiding organizational activity as it properly should.

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