Design Design: A Theory of Design*

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The focus of design design, as a theory of design with associated tenets, is that design, a human activity, is discovery; it is discovery of existing but as yet undiscovered ideas; and ideas are only possessed by individuals. Design is also decisions—decisions in the context of uncertainty—decisions among alternatives based on human preferences and human expectations of the future. Design Design: a Theory of Design, addresses both designing design as well as the design of design.

INTRODUCTION

WHILE SOLELY INTENDED to be positive helps, the proposed design design theory of design and associated tenets admittedly invite a reconsideration of many traditional precepts, models, and concepts of design, including:

- the idea that there really are items called requirements that are separate from design decisions—as if requirements were uniquely the 'what' and design decisions were uniquely the 'how';
- everything about so-called system engineering (as a declared management technology) and its associated set of system engineers, and also requirements engineering and requirements engineers—especially as both claim the writing of 'requirements' for separate use by 'designers' as a primary role discriminant;
- the use of RFPs for competitive designs as the basis for development contract awards;
- the use of design teams, with a team leader, as design decision-making groups;
- the use of engineering as an adjective on design as in 'engineering design', on the basis that design is not only universal (not de-limited by engineering so-called) but is the integration of engineering (calculations), science (facts and laws), and art (human judgments—preferences and expectations).

TEN DESIGN DESIGN TENETS

Ten tenants are offered below as elements of a theory of design. But why a theory of design, with tenets as opposed to just processes? The effect and essentiality of a Design Design Theory of Design, with associated Tenets (in addition to processes) might be seen to be equivalent to the impact of a presumption of innocence versus guilt on the same judicial processes. The Design Design Tenets address, as depicted below, an expansion on the early

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'task or project-centered work' of leaders such as Taylor and Galbraith, and then W. Edwards Deming's contribution of the need for more than just optimum projects or tasks—namely for processes. The recognition now is that, as depicted in Fig. 1 even more than processes, the need is to also address the tenets (precepts, concepts, and models) for the *application* of extant processes.

A key to design is understanding; in fact design is the means to understanding. And a key to understanding is the *why* or *purpose*, and that is an added reason for a Design Design Theory of Design, with associated Tenets, in addition to processes, for process loses purpose.

Three-dimensional (3-D) thinking

With a focus on ideas (thinking) Tenet 10, as a foundation Tenet, applies dimensional thinking (3-D Thinking) by asking the Great Question (GQ): '*What might be at least three dimensions of this?*' And applying the GQ to ideas (where ideas are the basis of design) further suggests, as shown in Fig. 2, three dimensions of an idea: *Insights, Issues, Initiatives.*

Three systems—not just one

Three-dimensional (3-D) thinking also leads to the recognition that there is not just the typical single *Delivered* system to be designed, but also, as illustrated in Fig. 3, the *Delivery* and *Discovery* Systems.

Indeed the design of the other *Delivery* and *Discovery* systems needs to precede the design of the traditional single *Delivered* system. And, since design is about discovering and nurturing ideas (for the *Delivered* as well as the *Delivery* and *Discovery* systems, the design of the *Discovery* System is the most critical. It is the system to invite and assess ideas and design options about both itself as well as the *Delivery* and *Delivered* systems. Similarly, the design of the *Delivery* System, as the system to deliver and confirm the design options and their assessment is equally essential as the basis for the design of the final *Delivered* system.
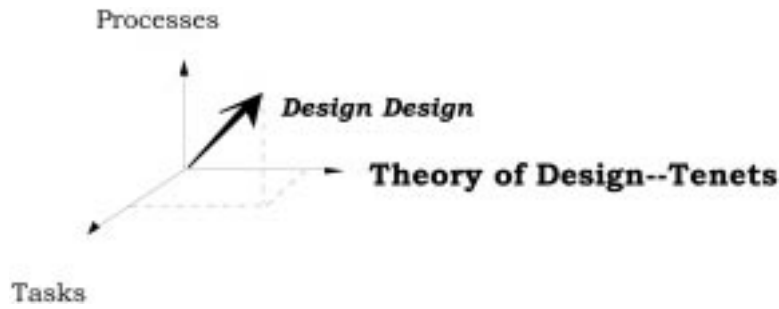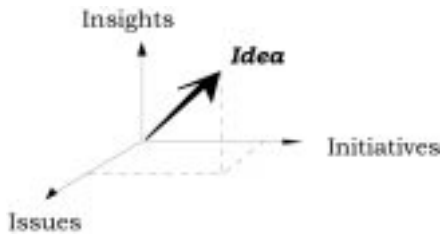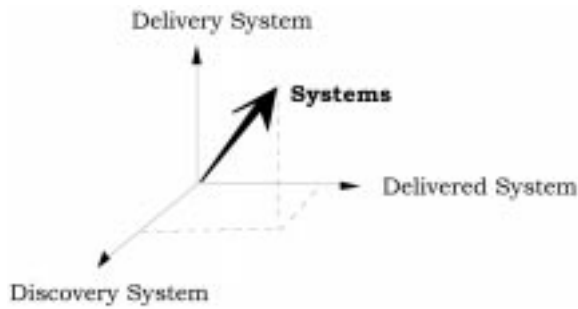
R. Evans

Fig. 1.

Fig. 2.

Fig. 3.

A 3-D DESIGN DESIGN TENET FRAMEWORK

Using the three systems as a 3-D baseline provides the following dimensional framework for the Ten Tenets, (as depicted in Fig. 4—with the Design Design Tenet Numbers cited in parentheses).

Design Design Tenet 1

Separate the design projects from the implementation projects. Apply design efforts as the basis for, and as the design of, implementation projects. Apply design effort delegations, including contracts, for united 'Design Work' not for 'A' Design—especially not by RFPs for competitive designs done in isolation.

The essence of the major contrast between a competitive design RFP model and a Design Design model is illustrated in Fig. 5.

There are two key differences, as depicted:

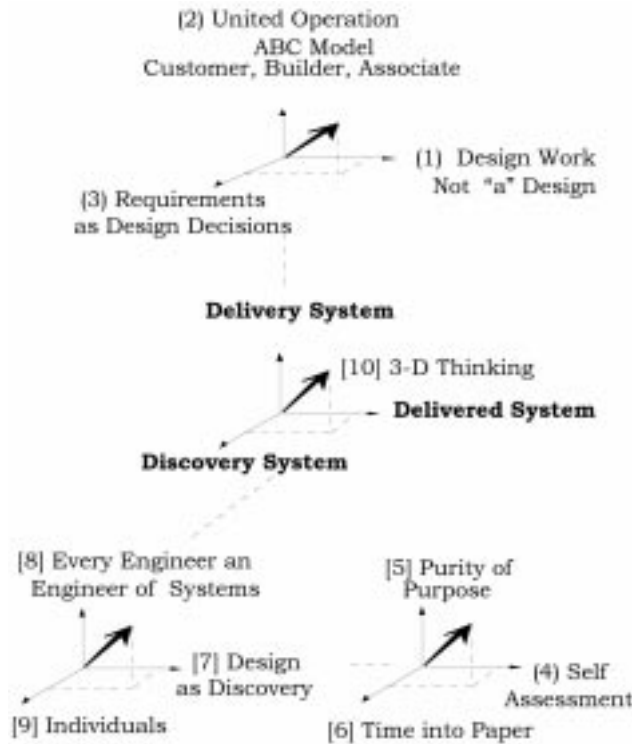1. Separate the design effort completely from implementation projects. In Design Design
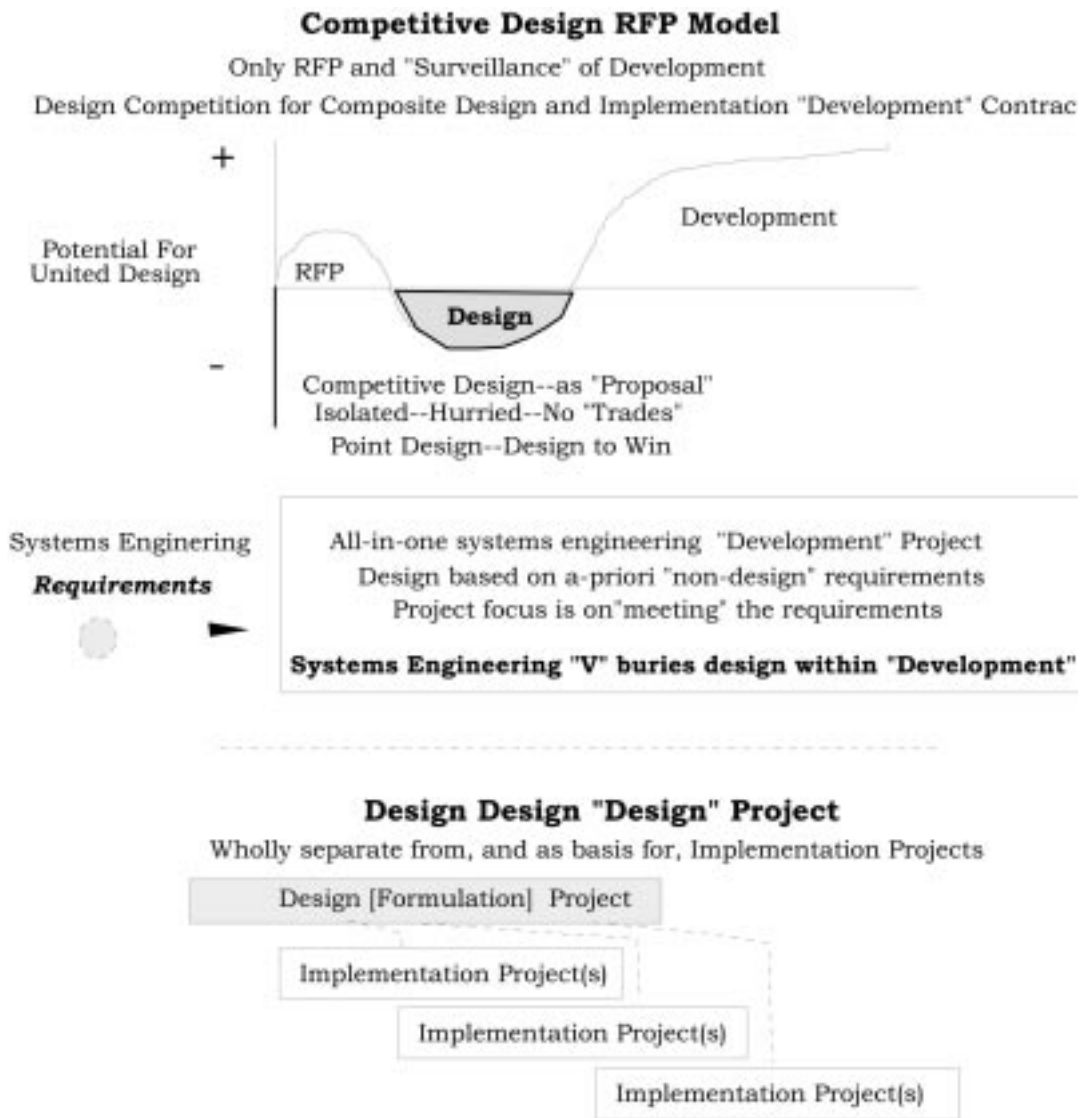

Fig. 4.

Competitive Design RFP Model

Only RFP and "Surveillance" of Development

Design Competition for Composite Design and Implementation "Development" Contrac

Design Design "Design" Project

Wholly separate from, and as basis for, Implementation Projects

Fig. 5.

there are no composite design and build 'development' projects—where design is buried within a fixed 'delivery' budget and schedule, etc. The competitive design RFP model is the essence of systems engineering and systems engineers who declare that their responsibility is to 'meet' customer requirements. They also mandate that systems engineering is a 'management technology'—to manage the design and implementation of the 'product' (fully tested, and installed, etc.,—all in a single 'development' project.

2. Move the design activity out from under a contractor-only effort that is (a) prepared in complete isolation from the customer-confirmer (no consideration of customer preferences and expectations for the future, etc.), and (b) is a competitive point design that is established solely on the criteria of winning the contract award—strict adherence to every so-called 'requirement' etc., even if deemed to be unwise (and possibly even deleterious, etc.)

given the possible trades 'discovered' as the product of the design effort.

Design delegations (contracts) for design work, vs. 'a' design to be based on:

● Summaries of past performance in design work: (nominated options with alternative assessments)—including customer references of those thus served.
● Samples of potential design work (nominated options with alternative assessments) in the context of, or similar to, the proposed 'design work'.
● Synopses of capability for the proposed design work, such as tools, personnel, resources, etc.

Design delegations, including contracts, would thus be based on (1) the performing organization's capability to produce multiple design options, (2) the thoroughness, completeness, and expertise demonstrated by such options, and (3) their experience in delivering systems of similar characteristics and complexity as well as structure, function, and
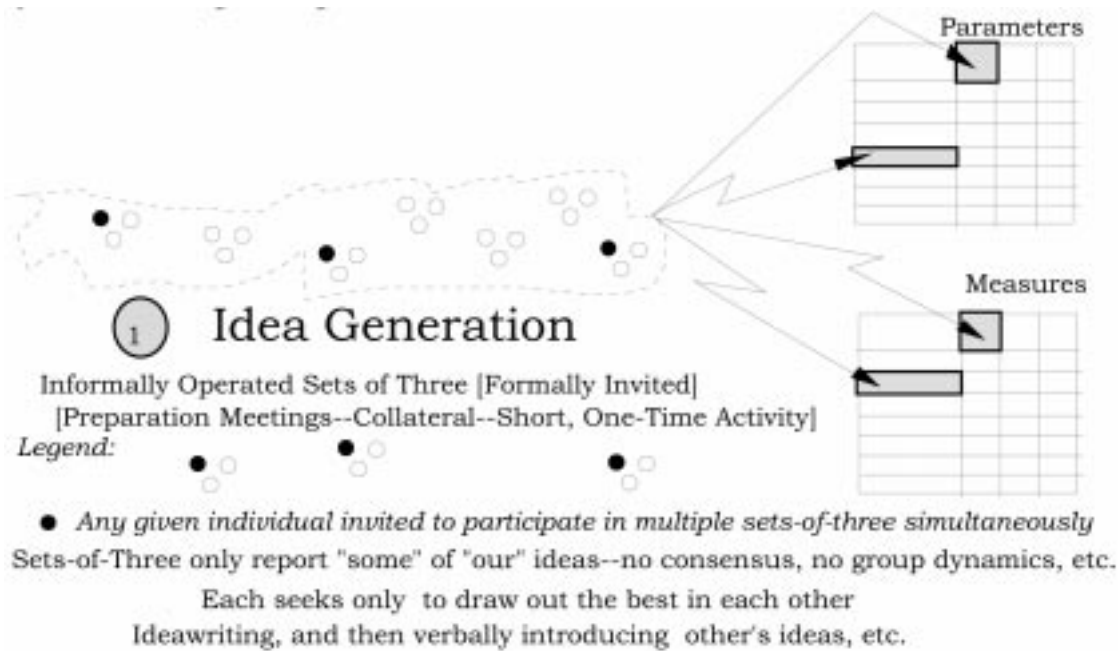
Fig. 6.

purpose. In Design Design the builder's *performance* products would be the design options nominated, with alternative assessments for customer confirmation throughout the continuum of the 'design work' as further addressed in Tenet 2.

Design Design Tenet 2

United 'Customer-Confirmer' and 'Builder-Nominator' design—equally yoked to their common design wagon, operating by invitation, nomination, and confirmation—each as designers of 'our' system, assisted by those in the impartial, experienced, unbiased, altruistic Associate-Helper role.

The goal is a *united* Customer-Confirmer and Builder-Nominator design effort, with an '*us*', '*we*', '*our*' view of '*their*' system, and all equally involved in the design—all as 'designers'. The aims include, as shown in Figures 6–12, the *unified* operation of design on the three dimensions of (1) *Universal* identification of ideas in informally operated sets-of-three, (2) the application of formally operated engineering calculations to measure and assess the alternative decisions in terms of the criteria, and (3) the *united* formal operation of the delivery (decision) system by responsible individuals equally yoked in invitation, nomination, and confirmation.

First, the identification of ideas (idea generation) includes, as shown in Fig. 6, the generation of (a) alternative decisions (columns with parameters as rows and values of the parameters in the columns to establish the definition of each alternative), (b) criteria for their assessment (rows) of the bottom matrix in Fig. 6, and also (c) initiatives as to other possible sources of ideas. Matrices, that apply parallel construction (every row of criteria applied equally (equally yoked) to every column of alternatives.

Pros and cons comparisons are not present in Design Design. Their use is deliberately not parallel construction—the criteria (attributes, features, parameters, etc.) considered for one alternative are not considered for both (or even all). And design is wholly dependent on consideration of all alternatives in the same light, under the same stresses, uses, criteria, risk areas, expectations, etc.—with emphasis on the plurals. In addition, the use of pros and cons is only a pair-wise compare and contrast—rather than assessment of all alternatives simultaneously. In addition, the aim of pros and cons comparison is only to show the best and worst features—not all features; and it is not directed to the key purpose of assessment— 'Discovery' i.e. to find more criteria and more alternatives. Discovery is a key objective in Design Design.

The formal invitations in establishing the sets-of-three, and their informal operation, is addressed in added detail in the context of Tenets 5, 7 and 9.

The second dimension to be '*unified*' with Idea Generation is the formal engineering calculations—to establish specific values of the 'alternative definition' matrix, and also the assessments of those alternatives in terms of the assessment criteria. This is depicted in Fig. 7.

The united 'Equally Yoked' operation of every pair-wise interface is depicted in Figs 8 and 9. The primary principle is that all decisions are initiated as nominated alternatives, with recommendations , for confirmation by the one possessing the expected outcomes on each alternative and the preferences on those outcomes. This is the very opposite of the model imposed by so-called 'requirements'—namely a top down 'I Require', with a 'I will meet the requirements' response. Requirements are the enemy of design.
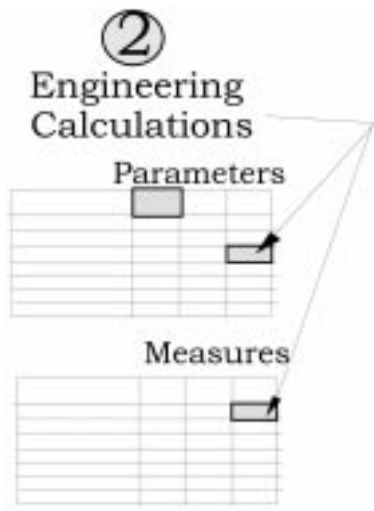
Fig. 7.

Fig. 8.

Operating equally yoked in the framework of Invitation, Nomination, Confirmation assures that those appointed to serve in customer-confirmer roles (as elements of the design of the Delivery System) for the many decisions in a design apply their 'in-context' preferences on their judgments of the in-context expected outcomes. Further, nomination from the bottom assures that those who implement the confirmations understand—as it was their nomination—and also assures integration by each level of customer-confirmer. Allocating 'requirements' downward (imposing them unilaterally) results in non-integration. Each recipient has no knowledge of what was 'allocated' to others, etc. The added strength of nomination-confirmation is that it operates 'only by persuasion'—exactly like the US Constitution and the equally yoked operation of the White House and the Congress.

The Associate-Helper role shown in Figure 9 is committed to the success of the two responsible nominators and confirmers. The equally yoked pair-wise operation, with each builder-nominator employing informal sets-of-three and formal engineering calculations is a fractal. It is, as shown in Fig. 10, the same pattern at every level, for every pair-wise interface—up and down and all across everyone participating in the design.

The *Unified* operation on all three dimensions of design: (1) Universal perspectives and ideas in formally invited but informally operated sets-of-three for Idea Generation ; (2) Formal Engineering
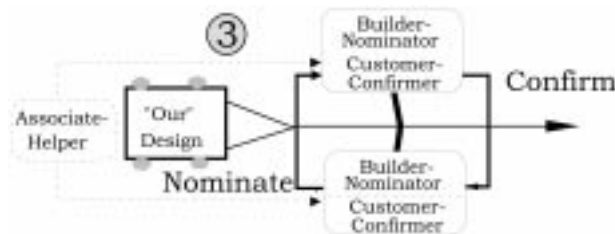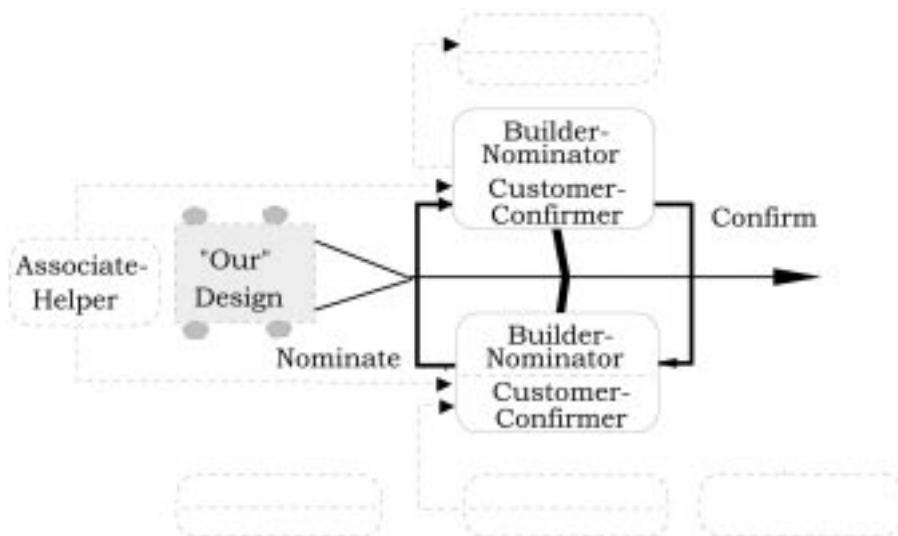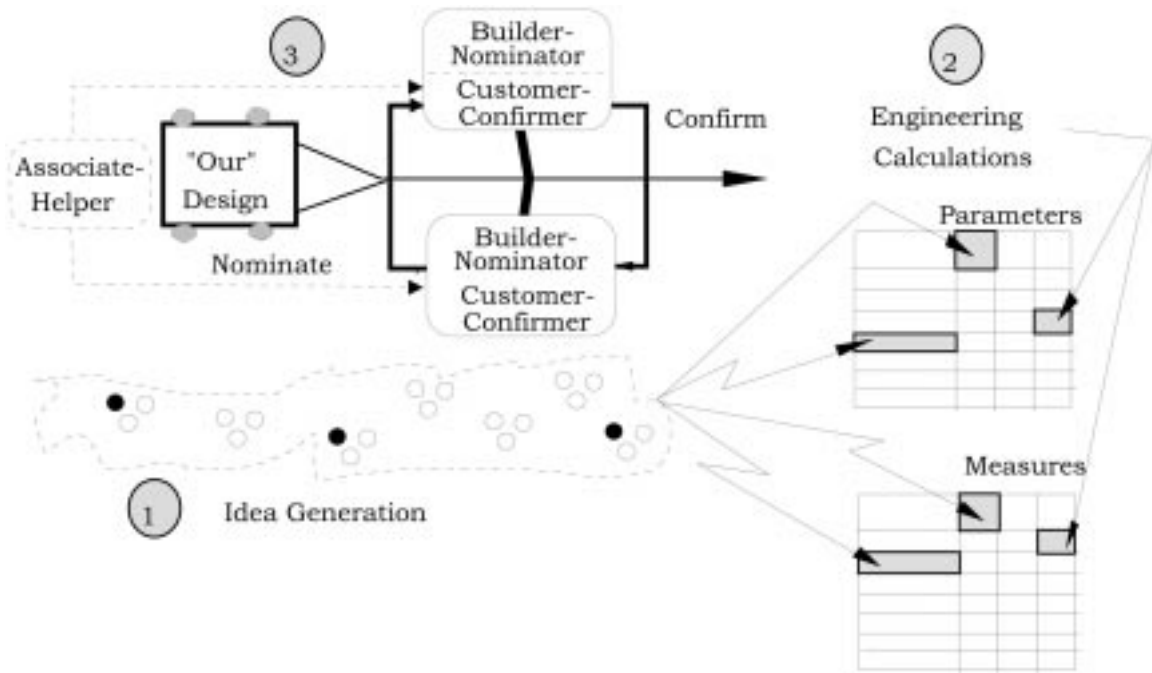

Fig. 9.

Fig. 10.

Fig. 11.

Calculations; and (3) *United* 'equally yoked' decisions by nomination then confirmation of decisions for 'our' design, as depicted in Fig. 11.

Customers and builders operate, as cited in Fig. 12, by *Invitation, Nomination*, and *Confirmation* (INC)—never by customers unilaterally imposing on builders any design decisions—including design decisions that may be separately (yet incorrectly) called 'requirements'. As also depicted in Fig. 12, design decisions address the three basic dimensions of Ratables (Measurables), Rationale, and Relationships. And Rationale includes Models, Views, and Scenarios.

The theme in united design is '*Only by Persuasion*'—never by compulsion. The basic three (and only three) roles (relationships) in design (for individuals and/or whole organizations), would be recognized and applied in the *Customer-Confirmer, Builder-Nominator*, and *Associate-Helper* (ABC) model:

In the 'ABC' model, Customers and Builders would be equally accountable in the united design of their system(s)—assisted by those in the associate role. The Builder nominates to the Customer design options, with comprehensive assessments and trades, etc., and with full 'system' performance accountability for each nomination. The Customer exercises final confirmation of their preferred option(s) from among those nominated by the Builder. The Associate-Helper role serves both the Customer-Confirmer and the Builder-Nominator as the altruistic, impartial, and experienced assist—totally committed to the success of the united Customer and Builder.

Design Design Tenet 3

Requirements (so-called) are recognized to be Design Decisions. Each design decision is a 'requirement on' subsequent decisions.
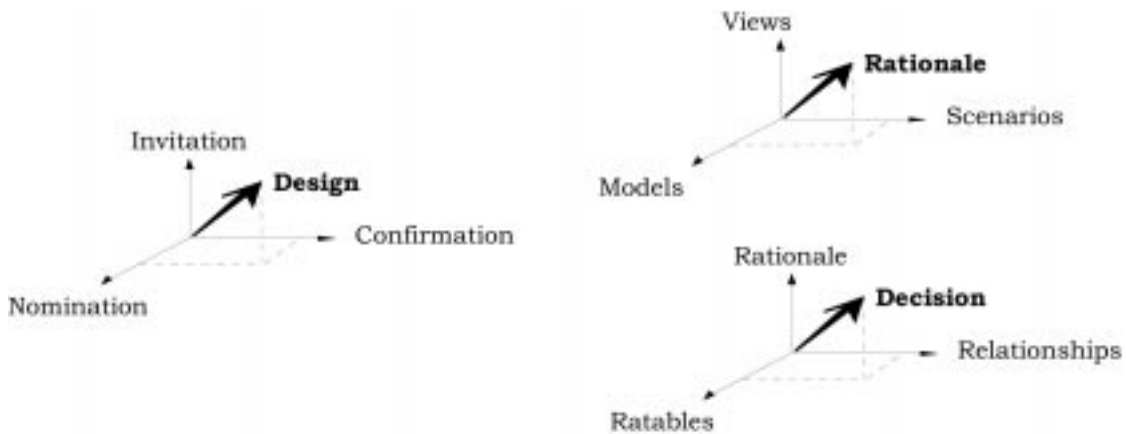

Fig. 12.

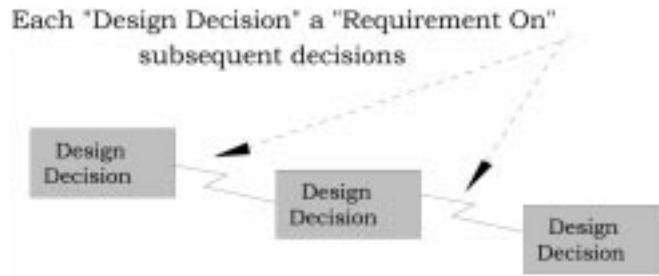Each "Design Decision" a "Requirement On" subsequent decisions
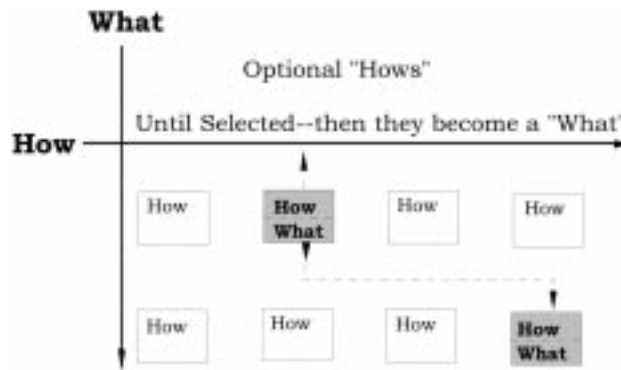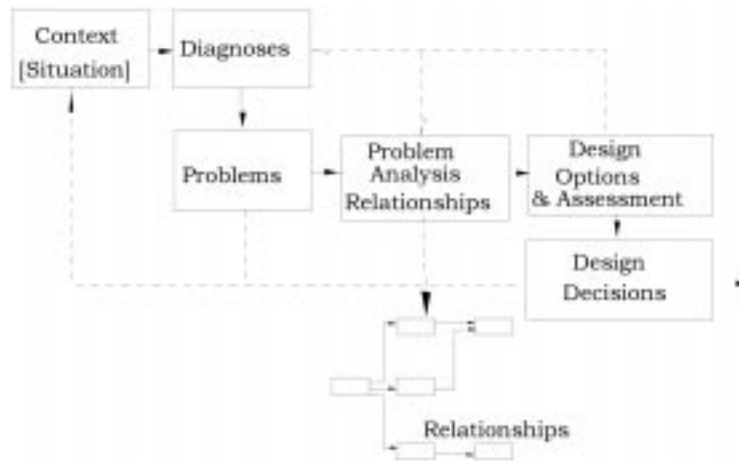

Fig. 13.

Fig. 14.

Fig. 15.

The term requirement, (recognizing that so-called requirements are no more nor less than design decisions), would apply only as an adverb, never as a noun: i.e. each design decision is, as illustrated in Fig. 13, naturally a '*requirement on*' all subsequent design decisions.

No set of design decisions would ever be separately named as 'requirements' and separately treated as different, unique, or in any way distinct from all other design decisions, especially such as designating some as uniquely the '*what*' and thus distinct from design, as if design was separately the '*how*'. Rather, each design decision (a selection from among alternative '*hows*' for a given '*what*') would be seen (as shown in Fig. 14) to be simultaneously both a '*what*' to subsequent decisions, and a '*how*' to those preceding.

There is a hierarchy of decisions, but it is set by timing sequence—a temporal (timing) hierarchy—not as so-called system levels, such as top-*level* decisions, etc. The initial design addresses not levels but situations—the extant and desired states. Situations, once established, are, as shown in Fig. 15, then diagnosed *in order to understand* the associated reasons (the problems), and their interrelationships.

Design initiation would not be focused on either 'problems' or so-called 'requirements', but on assessment (understanding: the purpose—the why) of the existing and desired situations (states). The diagnosis of the situations would then address the identification of the problems and their interrelationships. Understanding originates not with a list of problems (typical requirements or *shall*

statements), but with the ongoing consideration of the situation. The design effort itself is then a continuing effort to 'understand' diagnoses of the situation-established candidate problems. A key activity at that point is to then develop and display the multiple sets of relationships that exist among both the problems and the optional design decisions discovered as a means to address the problems. That provides a sound basis for each decision as well all decisions that then follow.

Design Design Tenet 4

  Self-Assessment Plans: (Builder-Nominated, Customer-Confirmed)

Those responsible for design efforts would include in their plans (that are nominated—with options—for confirmation) self-assessment plans that would include the plans for all reviews, both internally operated and reported, as well as all externally operated with independent reporting commissions. And plans for reviews such as PDRs, CDRs, etc. would include the schedules and agendas for multiple sessions of all three types of design meetings (as addressed further in Tenet 5) not just for the traditional single meeting that is (inappropriately) attempted as a single formal setting for all three purposes.

  Each reviewer, regardless of whether internal or external, whenever they participate—with or without an independent reporting commission—would also always serve as an *invited* and thus fully *'contributing'* member of the design effort. All 'reviews', especially those commissioned with independent reporting, would always focus on assisting: everyone involved would see themselves as helping, and aiding in 'our' design. Thus, ideally, the 'independent' reporting would be simply to confirm that the design of 'our' system was now as best as could be achieved: it would be to report the aid provided, the design course, corrections effected as a result of the review, and the expectations for the future in the implementation of the *nominated* and *confirmed* self-assessment plan.

  As a reiteration, self-assessments would be nominated and confirmed for all three systems, (discovery, delivery, and delivered) not just the single delivered system control of all assessments (internal as well as external) would be exercised by those in the customer-confirmer role: in (1) their confirmation of both the nominated self-assessment plans, and (2) their control of the formal reporting of the self-assessment plan implementation.

Design Design Tenet 5

  Purity of Purpose in Design Meetings (Preparation, Presentation, Confirmation)

Three separate design meeting types, and associated purposes, are identified: Preparation, Presentation, and Confirmation. The purity and quality of results is directly related to the degree to which the purpose and thus the operation of all design 'meeting' events are honored and maintained unique, separate, and pure. While all design meetings are of necessity formal in their *organization* (who, when where, why, etc.), the three separate design meeting types, as tabulated in Table 1 would be uniquely distinct in their *operation*.

  Ideally, no meetings (especially design reviews) would be attempted as combinations of any of the three separate meeting types and purposes; such as, for example, so-called 'informal discussions' that are nevertheless conducted in a very formal setting, with a boss presiding, etc.

  Preparation meetings would optimally be effected with all participating in formally organized but informally operated sets of three—with the only 'purpose' the drawing out of the best in each individual. The members of each set could be either physically together or at times linked by media, etc. Further, any given participant in a set-of-three may well be simultaneously participating in other three-person sets throughout a given day or period (multiplexing). The sets-of-three are temporary, are not 'organizations' with any design responsibility other than to serve each other in discovering the best ideas in each member, and as a united effort to discover 'third ideas'. Even the presentations by the sets (to other sets-of-three as appropriate) are only as 'some of our' ideas—always avoiding any personal attribution.

  At any given moment in such 'meetings' (interactions) one member is, as shown in Figs 16 and 17, in the Customer-Confirmer role, one is the Builder-Nominator, and the other is the Associate-Helper. The three roles rotate dynamically—as the members commission each other.

  Design decisions in so-called 'decision' meetings would be avoided. Rather, decisions would be reached by three steps:

1. Presentation meetings.
2. Announcement of the intended decision after—and separate from—the presentation meetings—with that announcement including the details (time and place, etc) for step 3.

Table 1.

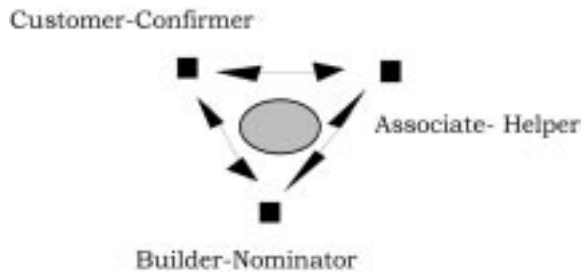| Type	Purpose	Operation
Preparation	Discover options and alternative assessment criteria	Informally
Presentation	Present results: 'us', 'we' 'our' options and assessments	Semi-formally
Confirmation	Confirm (1) the pre-announced tentative decision, and (2) all that appropriate parties have been included in the effort	Formally

Fig. 16.

3. Formal 'confirmation' meeting (the only meeting of the three that is formally operated—like graduation or wedding events).

Further, all such 'decisions' (tentatively announced initially, and then formally confirmed later) would always be only by a single responsible individual, never by 'teams' or groups, etc. Groups and so-called 'Design Teams', 'Concurrent Design Teams (CDTs)', 'Integrated Product Development Teams (IPDTs)', etc. would never ever be established or operated. Groups and teams etc. have emergent behavior. Their ideas by concurrence are wholly dependent on the rules for their operation. They are also intransitive—they will prefer A over B and B over C and then C over A, etc.

Design Design Tenet 6

Time into the Paper on Design Schedules—subsystems not at same state on same calendar date.

It would be recognized that all subsystems are seldom at the same state on the same calendar date. Detailed 'integrated' planning for each subsystem would address (as time 'into', not 'on'

the paper) their individual timelines as well as their potentially unique issues, circumstances, and risks. The design schedule for individual subsystems would be effected on their own timeline; time would, as depicted in Fig. 18, be into the paper (in contrast to 'on', as on a left to right axis).

Major 'reviews' such as PDRs, CDRs, etc. when planned as an aggregate set of all three types of sessions: Preparation, Presentation, Confirmation, would provide appropriate sessions for each subsystem, such as regular (quarterly, etc.) 'status against plan' reviews.

Design Design Tenet 7

Design as Discovery—Decisions under Uncertainty with Risk—Nominated de-selection of least bad, and confirmation as 'our' united decision.
Design is discovery—the discovery of existing but as yet undiscovered *ideas*: ways to do things, ways to assess things, ways, even, to do better discovery: i.e. the design and application of the *Discovery* system itself, as well as the *Delivery* and *Delivered* systems. Design is exploration, and is focused on the individual—the one source of ideas. Design is thus also decision about what has been discovered: the options identified, the assessment alternatives considered, etc. And decision is always in the context of risk: uncertainty, probabilities, unknown potential interactions, budget dynamics, changing external and internal contexts, to-be-decided preferences, expectations (judgments—even guesses) about the future—expected outcomes—even on potentially yet-to-be discovered options and events, etc. The entire design effort is about addressing (managing) risk. All design management is *integrated* risk management—thus separate 'risk management' plans or
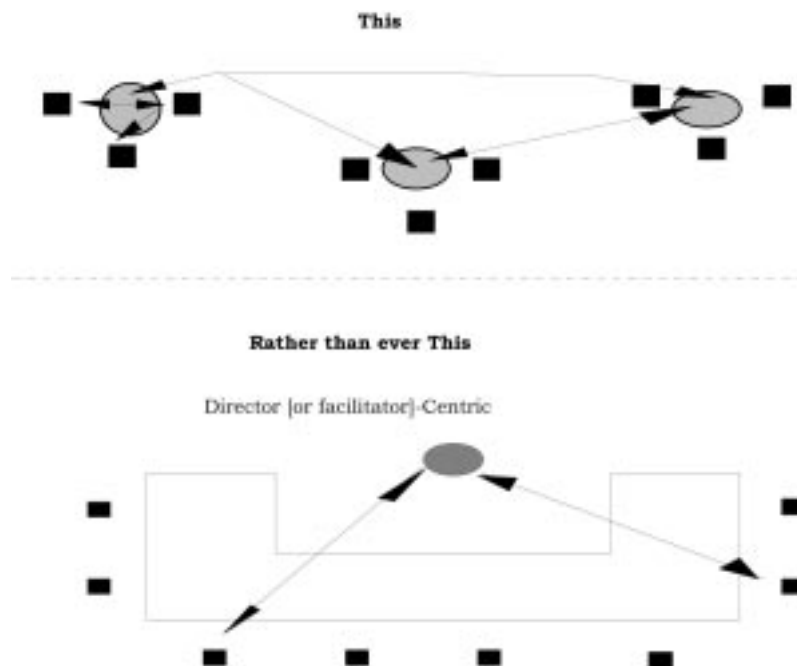
This

Rather than ever This

Director [or facilitator]-Centric

Fig. 17.

Time into the paper

Fig. 18.

System Engineering Management Plans (SEMPs) would be avoided. And, as cited in Tenet 5, design decisions in so-called 'decision' meetings would also be avoided, along with the misuse of individuals by assigning them to decision-groups or so-called design teams. Groupings of individuals would be only in sets-of-three for the sole purpose of discovery—with no consensus or decision, only to identify 'some' of 'our' ideas.

Design decisions would thus not be formulated and finalized in a single step in a formally operated meeting (operated formally by a boss) especially where the boss announces the decision 'on-the-spot' and, worse, extends a query such as 'We all are agreed, right?' —as if silence in such settings ever implies consent. And in an even worse, but very typical, scenario to be avoided is for a boss to task so-called 'Design Teams' or groups, or boards, etc. to achieve decision consensus, i.e.: a 'team' design as if such inappropriate assignments of individuals to groups or teams is the basis for an equally inappropriate focus on so-called group or team dynamics, etc.

Inappropriate 'decision group' use of the individual seems to also lead to other design difficulties including forming groups based on balances in (1) Myers-Briggs type classifications of individuals—classifications that are false because individuals are not fixed in their nature but are different in different types of settings and with different associates, and can and do become what others encourage them to be, and (2) technical disciplines—as for so-called inter-disciplinary teams—with a member representative from each key discipline, etc.

For interdisciplinary discovery, especially, each individual could and should reach out to many, many others who have added expertise—and in their own as well as in other disciplines. Forming a set of individuals as a discovery design team (decision unit), etc. strictly on the basis of one each for each discipline—and thus solely on the basis of their individual expertise in that particular discipline (as if that set of individuals by themselves would then provide either a comprehensive set of inter-disciplinary design options, or assessment criteria, etc.) should be especially avoided

Individuals are ideally only formed into informally operated 'groups' or teams for the sole purpose of discovery, and only as sets-of-three; thus one each for each of ABC model roles, and with each dedicated to helping each of the other two as they then together discover 'some' of 'our' wonderful ideas—never assign individuals to groups that must reach consensus (a design), especially not in leaderless groups, who then have to decide among themselves how to decide, etc.

Design Design Tenet 8

Every Engineer an Engineer of Systems—with self-responsible System Perspective—to whatever scope feasible.

Every engineer would see themselves as an engineer (designer) of systems—viewing themselves as 'from the system' to apply their special expertise in minimizing their part of the system—all in the interest of maximizing '*their system*.' All would see themselves as representing 'their system' to 'a part'—not 'their part' to 'a system'.

Every participant in design efforts (including those in supporting disciplines such as procurement, legal, manufacturing, training, operations, personnel, disposal, etc.) would also accept the *self*-responsibility for the development and sustaining of a common 'system vision'. Individual effort and self-responsibility for achieving system abilities and perspectives would be the model—rather than the opposite of 'pouring-in' training classes, etc. Leaders would encourage that personal development by, for example, inviting regular reports (written and presented) on each individual's 'system capability' plans (and results).

Appointed responsibilities, applicable only for the duration of the effort, such as Project Manager, Assistant Project Manager, Deputy Project Manager, Chief Engineer, or System Engineer, would be just that: *appointments*. They would have the scope and responsibility of the appointment established only by the appointment—never by a claim based on a 'profession' such as a 'system engineer' profession'.

Design Design Tenet 9

Design as the nurturing of ideas—and thus individuals—ideawriting, avoiding personal attribution, etc. (personnel logistics as a central technical feature of design).

The key to design is the nurture of ideas. Individuals typically 'discover' ideas by activity on all three dimensions of (1) Reading, (2) Reasoning, and (3) Writing, as cited by Francis Bacon: '*Reading makes a whole man, Reasoning [with others] makes a complete man, Writing makes an exact man.*' And, as ideas are generally 'third' ideas, they are seldom possessed by either party, but are 'discovered' in formally organized but informally operated (no externally designated boos) idea discovery efforts.

An appreciation of the principle of the *third idea* sustains a focus on 'system' *understanding*, and, in turn, on *purpose*. With a constant interest on *Why*
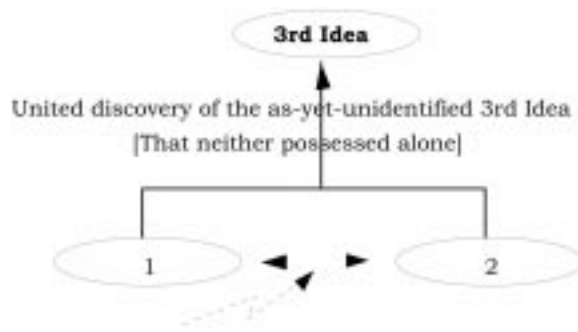
Fig. 19.

(or purpose) enables participants, being united in seeking a common as yet-undiscovered aim, to achieve a higher purpose: to seek a third idea (a discovery) that neither possesses alone. Thus the need is not just two-way communication at all, but, as shown in Fig. 19, united, side-by-side (equally yoked and commonly aligned) seeking for a new discovery—an existing but as yet unidentified or 'discovered' idea (Insight, Issue, Initiative). United discovery (equally yoked) is the criteria for being united. To simple walk side by side, to simply co-operate, to simply communicate, etc is not to be united. Only when both parties are equally yoked in seeking discoveries for a common purpose, a common design challenge, etc are they truly 'united.' Thus it is not more communication that is needed; it is more united seeking, to discover.

In fact, while united discovery automatically strengthens the supporting basic communication, focusing only on better communication without a unity in a higher common purpose (such as united discovery) actually weakens the basic communication. Similarly, leadership that is directed other than to organizing team members to serve unitedly in achieving new discoveries, weakens those who are being led. Further, teamwork (team sprit) is never something imposed, (as arbitrarily imposing the name 'team' on any boss-directed organization). Team spirit (like peaches emerging from a peach tree) only emerges naturally or it emerges not at all. Team spirit emerges only from sets that are formally organized (like the coach designating who is on the floor at a given moment) but are informally operated (no externally designated boss). Thus the term 'team leader'—as an external appointment—is a true oxymoron.

Since design is the care and feeding (*the logistics*) of individuals in order to help them discover their ideas, where design is ideas, the Tenets include a specific technical focus on personnel logistics—the nurture of each individual—the sole source of ideas. The so-called 'logistics' of individuals is a technical centerpiece of design. Design is a holistic effort such that, rather than personnel logistics (the care and feeding) of the individual, ever being separate from design, it (personnel logistics) is a central technical feature of design.

Ideas need ideal conditions to be discovered and

identified, let alone to be brought to more mature fruition. They are like perishable seeds, in need of the most careful nourishment, especially in the initial stages. As with the seeds of giant sequoias which are as tiny as an oatmeal flake, the greatest ideas are initially the most small and fragile—by comparison, interestingly, to the larger and hardier acorns of scrub oaks. Great design rests on the nurture of tiny sequoia-like ideas.

Avoiding personal attribution of initial design ideas (optional solutions as well as alternative assessment criteria and judgments, etc.) can be especially crucial for the discovering as well as nurturing of great ideas. The need is to protect and preserve the initial merging ideas as well as the individuals participating in discovering them.

Idea discovery and nurturing is enhanced when thoughts are initially written (a step called *idea-writing*) and then verbally introduced (presented) by another. Introductions by other than the author enables several nurturing and protecting features:

1. Objective assessment by the originators who are typically the most insightful judge of their own thoughts. An individual's ratio of approval to disapproval of their initial ideas is typically very low—Hemingway throwing away opening paragraphs as many as fifty times, etc.
2. Ready adoption of any given idea as 'our' idea by all three of the set-of-three participants—especially the one providing the verbal 'introduction'.
3. More relaxed and thus more extensive and comprehensive presentation of any given ideas being done by other than the author. Being a self-advocate of a thought can often constrain the full emergence of that idea as well as interfere with others' enhancing as well as adopting it. Ideas are best when they stand on their own merits—with no self-attribution. And the open discussion of ideas after they are introduced enables non-attribution expansion, elaboration, etc., as ideas are accumulated simply as 'some' of 'our' ideas.
4. Simultaneous (in parallel by all)—thus faster discovery activity than sequential in-series identification of ideas: (Insights, Issues, Initiatives).
5. Avoiding climate setting that is immediate in serial verbal personal attribution meetings. What one says out loud immediately creates a 'climate' that often precludes others from sharing their current thoughts such that they then get lost, replaced by subsequent thoughts, or are even forever suppressed.

Design Design Tenet 10

Three-dimensional thinking for design options and assessment: 3-D Thinking—the Great Question: 'What might be at least three dimensions of this?'

The dimensions of a single vector 'topic' provide, as depicted in Fig. 20, a framework that, in contrast to lists or categories, retains all dimensions as interacting and interrelated elements of a

Fig. 20.

Fig. 22.

single vector. Dimensional thinking also invites expansion of all 'dimensions'. The essence of 3-D thinking is structure and dimensions.

Application of the 'The Great Question': 'What might be at least three dimensions of this?' provides a concentration on expanded views of the design. (The key to design is understanding, and the key to understanding is purpose, i.e 'Why'). Rather than 'lists', 3-D thinking encourages ever-expanding considerations, and preserves a structure for ready reference and consideration by all participants.

Design thinking also focuses on the 'Why': the purpose, that can be, as illustrated in Fig. 21, a third dimension of a rather basic or generic set with function and structure:

Rather than just creating closed 'lists' or 'categories', dimensional thinking (using the basic Structural, Functional, and Purposeful framework if needed as a start) would invite, not close, discovery. Purpose is the equivalent of Precepts; Structure is like Models, and Function is similar to Concepts or 'ways'. In fact, the Delivered, Delivery, and Discovery dimensions are ideally each considered from the Structure, Function, Purpose perspective. Dimensional thinking (3-D thinking) also suggests, as depicted in Fig. 22, three dimensions of the basic ingredient of design: an 'Idea', namely: Insights, Issues, Initiatives.

Dimensional thinking sustains the view of systems as a single vector—a single whole. Dimensional thinking also sustains sub-optimizing the subsystem as they relate to the greater whole—only optimizing the whole, not the parts.

In trade-offs, the emphasis would be on the 'offs'. In seeking to limit system segments to be the most simple but not too simple, each 'specialist' would see themselves as being sent as a skilled surgeon from their home in the system—with a system perspective—to reduce their assigned subsystem or component to the minimum—in the interest of the system as a whole—where least is
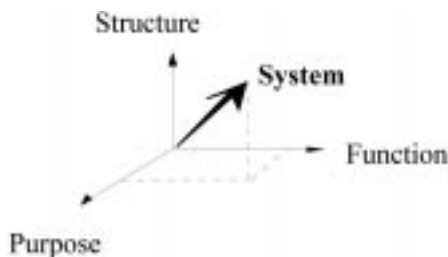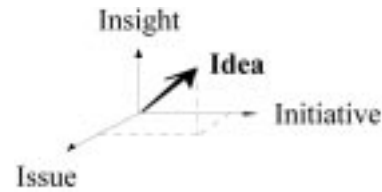

Fig. 21.

always best for subsystems. Dimensional thinking—all as dimensions of a single 'system' vector—also sustains the recognition that a system is not only a set of connected parts, but is a set of interactions between the parts, including the people and their organizations, and other systems.

SUMMARY

Design is discovery: the discovery of existing but as yet unseen '*ideas*'. Ideas are the basis of design. Ideas only reside in *individuals*, and they remain 'undiscovered' without special care of individual(s). That care includes:

1. Purity of purpose in meetings (as meetings are the primary design means—means for discovering ideas).
2. Preparation meetings that are comprised of sets-of-three in order to bring out the best in each member of the-set-of-three (one for each of the three—and there are only three) ABC roles: *Customer-Confirmer, Builder-Nominator*, and *Associate-Helper*.
3. Informal operation (no single boss) of the sets-of-three, applying *ideawriting* with introductions by other than the author.
4. Presentations to other sets solely in terms of 'some' of 'our' ideas—thus ever avoiding personal attribution.
5. Decisions that likewise honor the individual by always being reached by (a) a single responsible individual, never groups or design teams, etc., and (b) by a pre-announcement (published between the semi-formally operated presentation meeting(s) and the formal confirmation meeting) that includes a time interval during which anyone can contact the one responsible for the decision with any further thoughts, reminders, confirming counsel, etc.

Design as discovery relies on the *united* operation of the three design roles (the ABC Model—that serves *as a fractal for all interfaces, at every level, etc.*) In that model Customers and Builders are equally yoked in pulling '*their*' design wagon—equally accountable in the *united* design of *their* system(s)—with both being assisted equally by those in the Associate role:

● The Builder nominates design options to the Customer, with comprehensive assessments and trades, etc., and with full 'system' performance accountability for each nomination.

- The Customer exercises final confirmation of preferred option(s) from among those nominated by the Builder.
- The Associate serves both the Customer and the Builder as the altruistic, impartial, and experienced resource—totally committed to the success of the united Customer and Builder.

Design is delegated (contracted for) as *design work*, not for 'a' completed design—completed by competing builders in isolation from the customer. Customers competitively select (delegate to) those to serve in their Builder-Nominator roles based on:

- samples of design work in the context of the planned design effort: i.e. example nominations of design options, thoroughly assessed;
- summaries of past performance in design work, with references;
- synopses of capability for design work, such as extant interfaces and resources; and etc.

Design concentrates on *self*—especially on 'self-assessments' that are builder-nominated and customer-confirmed, and all, regardless of their role/relationship, as a designer (a discoverer), of ideas for 'our' systems: every engineer an engineer of systems.

Requirements are design decisions: and in reality all design decisions are *requirements on* all subsequent design decisions (where that phrase provides the only appropriate use of the term 'requirement'). There really are no 'noun' entities separate from design decisions that are uniquely termed 'requirements'.

Three-dimensional (3-D) thinking (the Great Question of 'What might be at least three dimensions of this?') invites and enhances discovery. As an example, 3-D thinking identified three (not just one) systems to be designed: the Discovery and Delivery systems as vital precedents to the design of the traditional single Delivered system.

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