Structured Planning in Design: Information-Age Tools for Product Development

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Introduction

Thoughtful designers have long recognized that the attitudes, viewpoints, skills, and ways of working we call design have great value for industry and institutions. The problem always has been that design's best value has been obscured by lesser values more visible and accessible. The miracle is that, in spite of trivialization as styling and fashion, design has continued to be taught and practiced as the full conceptual process it is.

There is a difference today. Overseas competition has done what decades of reasoning could not; design is being recognized as a major strategy for competitive success. Businesses and business schools are making genuine efforts to learn more about design, and to incorporate more sophisticated design thinking into their operations. Less visibly, but with as much long-term impact, a variety of governmental organizations, institutions, and NGOs (non-governmental / non-commercial organizations) also are discovering the value of design thinking.

In universities around the world, design educators and design researchers now find themselves with new audiences and new opportunities for leadership. A major challenge for all is to find new means—theories, processes and organizational models—that can permanently infuse design's values and benefits throughout commercial, governmental, and non-governmental organizations.

A Design Strategy

To see the multiple values of design most clearly, design should be viewed through the lens of quality, now the universally-recognized requisite for success in business. Quality for products (and artifacts generally), is almost always associated with craftsmanship—how well the product is made. But there are more dimensions to quality, and they can be best appreciated through a consideration of design.

The relationships between design and quality are expressed in the quality pyramid model (fig. 1). The pyramid has a multilayered design core, with craftsmanship as the first of three layers. From the design perspective, quality as craftsmanship is achieved through attention to issues of engineering design and design for manufacturing.

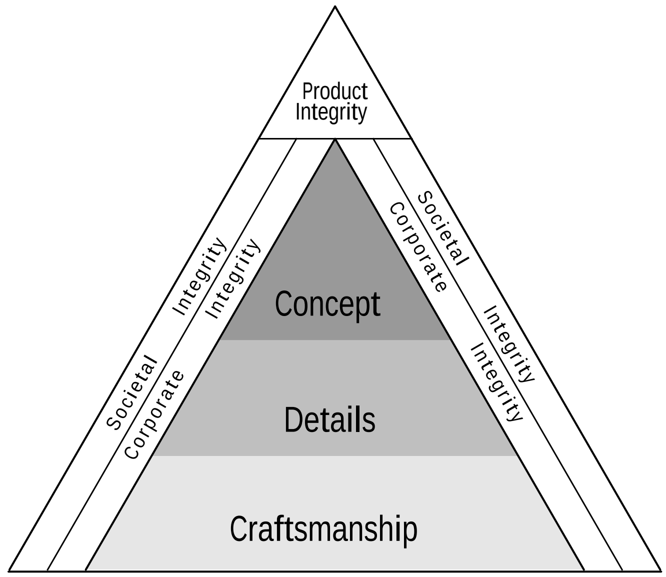


Figure 1
The Quality Pyramid.

Details are at the second layer of the design core. Here, the role of design is to contribute to performance, human factors, and appearance. Design specialists (engineering designers, product designers, industrial designers, communication designers, and others) invent and refine features or details to make the product work better functionally, work better for people, and work better symbolically within social and cultural niches.

At the third layer, *concept*, design contributes most to making products competitive (including systems, institutions, and services). Concepts that are holistic and thoroughly thought through appeal to the potential buyer or user as qualitatively better (and worth more). Typically, products designed well as concepts distribute innovations throughout their features so systemically that they are difficult to copy by competitors.

Capping the quality pyramid is *product integrity*; under it, quality extends outward to corporate and societal recipients. Products that are conceived, designed, and produced with high quality bring praise to the companies or organizations that produce them. Product integrity confers corporate integrity; corporate integrity, in turn, adds luster to the society in which the company operates. There is a reason why postwar Japan, *as a nation*, became identified with quality in less than a generation.

Problems of Planning

To reap the benefits of the quality pyramid model, we must fundamentally rethink the process of new product development. In today's highly charged business environment, revolutionary changes frequently may be more appropriate than evolutionary changes—a prospect for which the conventional development process is ill-prepared.

Against the aspirations of the quality pyramid, conventional planning for new product development fails in two critical ways. In depth, it fails to find and understand the needs of most potential users. The focus too often is on the *customer* and / or *the end user.* This ignores the many other users who also have much to gain or lose from the product's design—those who sell, transport, maintain, repair and retire the product —to name just a few. Listening solely to buyers and operators leads to shallow understanding. Shallow understanding is unlikely to fuel the holistic, thorough thinking necessary for systematically conceived, breakthrough products.

In breadth, conventional planning routinely fails to conceive the most potent product. Development effort typically lingers little more than momentarily on the issue of what the product should be. The concept to be developed, far too often, already is determined before development begins! To use an outdoor metaphor, the expert development team is off at the sound of the starting gun to climb the mountain—but the mountain may be the wrong one. Just any mountain won't do. If the purpose of climbing the mountain is to get to the highest ground, then it is important to locate the highest mountain before beginning the climb. In today's world, it is as important to know *what to make* as it is to know *how to make it*.

Reforming the Development Process

Overcoming these planning deficiencies is critical if the development process is to be able to produce products that meet the prospects of the quality pyramid model. As part of a reformation, processes for planning must be changed. How they should be changed requires a look at the development process in terms of design and its impact on a product's life span.

The Impact of Design

The business model is instructive. The costs a company incurs in developing a product can be nicely compared to the product's profitability by plotting investment and return over time. The form of an investment / return curve is loosely sinusoidal, as suggested by the light gray curve in the background of figure 2. The downward loop of the curve records the investment to develop the product. As the product goes to market, it begins to return value, and the upward loop of the curve records its financial return to the company over its life span.

Of course, a purely sinusoidal curve would be disastrous for a company because return over the product's life would only equal the investment. All companies work to reduce the size of the investment segment, both by shortening it in time and diminishing its dip. All companies also work to increase the size of the return segment, both by extending its height and lengthening it over time.

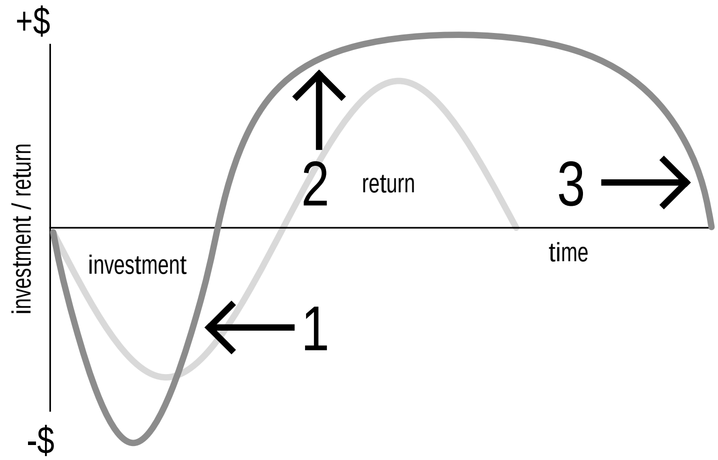


Figure 2
Improving the investment/return curve.

In today's marketplace, a design strategy can support these objectives in three ways.[1]

First, to shorten the length of the investment segment, the development process must be shortened. From simple physical prototypes for individual concepts, to computer-generated, close-to-real experiences, fast design prototyping can substantially shorten development time (arrow 1 in fig. 2) by close-coupling ideation and evaluation.

Second, to raise the return portion of the curve, the quality of the product must be improved. Human-centered design puts the focus for the design of details where it belongs—and where it is appreciated—on the users of the product. Products sell better if they are better designed for their users—all of them. This involves a deep appreciation of ergonomics and physiological, cognitive, social, and cultural human factors. The principles of human-centered design can be gathered here through Structured Planning to raise quality and, consequently, return on investment (arrow 2).

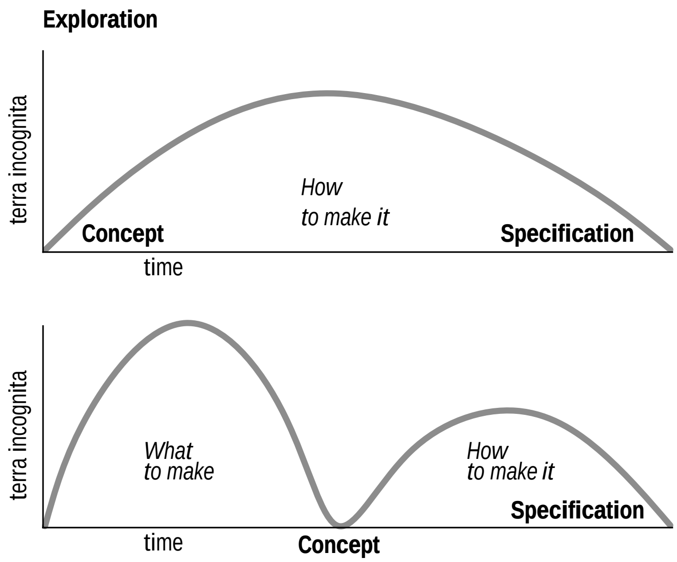
Finally, to lengthen the return portion of the curve, it must be difficult to develop competing products that can steal the product's success. Structured planning treats products and their supporting services as systems in which ideas are integrated systematically. Products conceived in this way are difficult to copy because their features are systemic. Elements of the design interact in interlocking components of hardware, software and service. Copying any one or a few individual components will not produce equivalent qualities (arrow 3).

Reforming the development process to implement a full design strategy requires all three of these individual strategies, but the major reform that must be made is an organizational one that affects how investment is deployed for *product finding*. Too often today, little or no attention is given to the *exploration* necessary for sound product concepts.

The development process must be changed from a one-step process, in which an already determined concept is turned into a

1 Patrick Whitney, unpublished speech, Motorola, Inc., Schaumburg, IL (February 10, 1994).

Figure 3
Above: 1-Step development *designing*
Below: 2-Step development *planning and designing*



specification, to a two-step process wherein a distinct development stage is devoted to exploration and determining the concept (fig. 3). The traditional process for which the issue is only "how to make it" must be reconstituted into two separate stages: *what to make* before *how to make it*. The product of the new planning stage of development is the concept; it becomes the "project statement" or "design brief" for the *designing* stage that follows.

The Development Environment

Simply stated, development is the process of producing an artifact or institution in response to an understanding of a problem or opportunity in context. Artisans do this routinely today; before the industrial revolution, it was the normal means of production. In essence, it is a direct form of "making" that moves between the realms of the analytic and the synthetic, without formal intermediate steps.

When systems of production reach a stage of sophistication at which designing and making are done by separate professionals, the development process gains another dimension. There is a distinction now between abstract and real, and the process of development moves to the abstract. Insights are drawn from context, converted at an abstract level to ideas and turned back to the real as specifications for artifacts or institutions.

The one-step development process is represented in this environment as a process of designing (fig. 4). The process begins with a concept, usually at least partially formed. Most often, the concept is an old one to be revised. Sometimes it is a preconceived new one, brought to attention by someone influential within the organization. Too often, it is simply a competitor's product—to be at least matched, and exceeded if possible.

Figure 4
One-step designing.

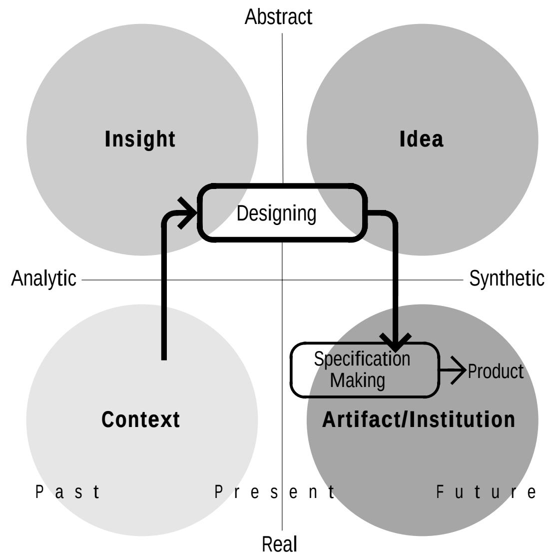
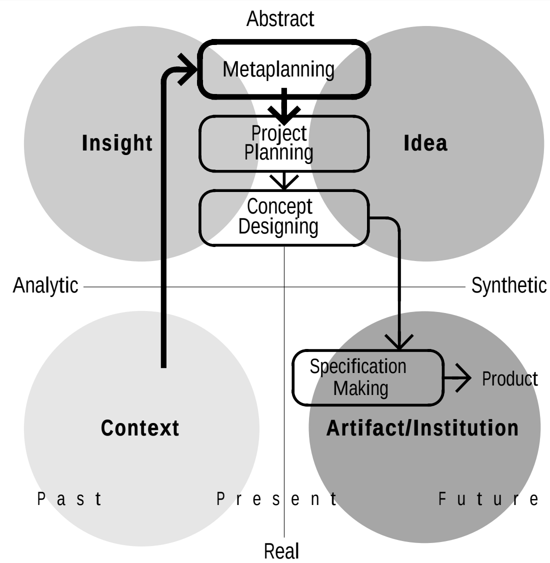


Figure 5
Three-step metaplanning+planning+designing.



The two-step development process, as a step toward reformation, adds a *planning* stage before the designing stage, formally separating the process of concept formation from the process of turning a concept into a specification. Planning is where “the right mountain” is discovered before the climb begins. Structured planning operates in this stage.

To optimize the planning and designing activities, a third stage should precede planning (fig. 5). *Metaplanning* in the three-step model is concerned with *planning the planning and designing processes*.[2] From the metaplanning level, product development projects are initiated by modeling context, identifying issues, establishing resources, selecting and modifying planning / designing methodology, and preparing a preliminary project statement.

2 Chi-Kang Peng “Metaplanning for Design Projects,” Unpublished Master of Science in Design thesis, Illinois Institute of Technology, 1993.

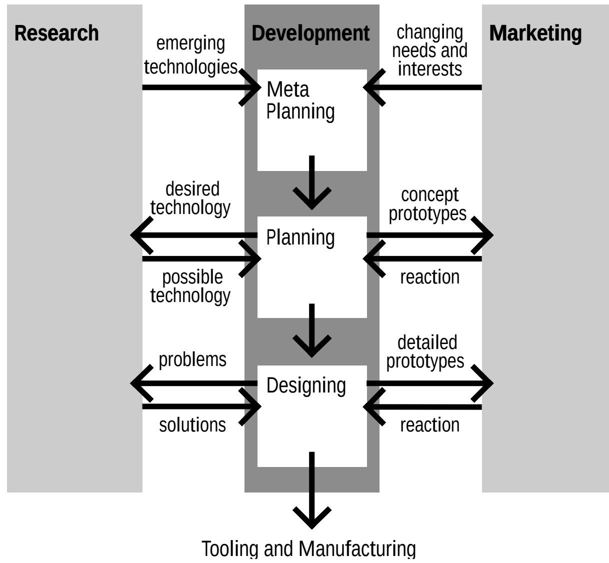


Figure 6
The business context: appropriate interactions at appropriate times.

Metaplanning is particularly important for the full-scale implementation of advanced-planning team operations. In the emerging new model for development, the processes for designing and planning will be as much a subject for development as the products they are used to develop. Those responsible for metaplanning will be closely associated with those responsible for the development of design processes. As better tools for planning and designing are developed or obtained, they will be custom-tailored through metaplanning to the goals of projects to be initiated.

The Business Context

In most conventional industries, the development function has strong links to research and marketing, as well as to manufacturing. Specific terms and descriptions differ among companies, but the general model places the concerns of research with problems the most distant in time, the concerns of manufacturing with more immediate problems; and those of marketing and development in the middle. The various forms of design and engineering expertise are intermingled with those of other relevant disciplines within these functional groupings.

Technological possibilities are investigated by research; user interests are most commonly championed by marketing. New projects are initiated with engineering consultation for do-ability, and there is little or no involvement of other design expertise. The two- and three-step models presented here reform these procedures by substantially augmenting the development process with design and other human-centered expertise at the front end of the process.

This has ramifications for the relationships between development and the other functional units. In figure 6, research, development, and marketing are shown as activities functioning in parallel. The three stages of the development process are shown within development, because they are supported primarily from that functional unit. Depending on the stage of a project's progress, the relationships between it and research and marketing are different, evolving as ideas coalesce.

Before project initiation, the relationship between development and research (at the metaplanning level) is one of technology assessment. The question is, "What impending technologies within or outside the company should be explored for implementation in new products?" The relationship with marketing at this stage is similar: "What needs and interests are emerging in segments of society?" Neither of these questions elicit product proposals; rather, they launch processes of scouting, exploring, and trend spotting.

At the planning stage of development, the relationships change to direct associations between a planning team and the special expertise of the functional group. Planning teams need suggestions and confirmations of technologies from research as they propose ideas. They need criticism and field evaluations from marketing as they develop prototypical concepts.

When a project has reached the designing stage, relationships between development, research, and marketing are more traditional. Technological problems and solutions are handled by research (when they are not manufacturing related); detailed demonstrations and prototypes are field-tested by marketing. At this stage, the members of the planning team will have returned to their functional groups as champions of the project.

Structured Planning in the Development Process

Within the spectrum of the development process, structured planning provides tools for the planning stage of development. From its inception as a response to general inadequacies in the design process, it has evolved to offer specific remedies for deficiencies of planning. To meet the breadth problem, for instance, it advocates segmentation of the development process. The existence of planning as a concept development stage separate from designing grows out of this advocacy. To meet the depth problem, as another instance, it has, within its tool kit, a process of action analysis expressly designed to seek out all users of a product and to gain insight about their needs from their behavior.

The tools of structured planning, some computer-supported, can be custom-tailored to a project and can be used with other planning tools. In essence, structured planning supports planning and concept development in two major ways: (1) it provides a philosophy, framework, and formats for discovering what needs to be done—with insight for why; and (2) it organizes this information in the best way for planners and designers to use it.

In its most general formulation, it progresses through five phases.

Project Definition

The first phase of structured planning is concerned with project definition. Working with a preliminary project statement and an initial set of issues selected as relevant by the project initiators (metaplanning), a planning team works to investigate the issues, develop arguable positions, and, through discussion and follow-up research, converge upon positions that optimize project goals. The phase concludes with a set of documents (defining statements) that effectively define the project.

Action Analysis

In the second phase, a process called "action analysis" is used to uncover in detail what the product must do. The failure of conventional planning to seek out all users and to consider their problems in depth is addressed in this phase. Action analysis is a top-down analytic technique for establishing the functions that must be performed by the product and its users (considered as a system). The system, as it begins to emerge from the project definition phase, is analyzed progressively: first to establish the modes in which it will operate (e.g., *distribution, transport, use, storage, maintenance, repair, adaptation, retirement—or, in the specific example of a television production system: studio operations, field operations, pre-production, production, post-production, management, transportation, etc.*); second, to identify the major activities that will take place within each mode of operation (under *production*, for example: *recording*, *participating*, and *conducting*); and, finally, to specify the functions that the system or user will perform in each activity. These *functions* are the "criteria" under which the system must be planned. They usually number in the hundreds, and they record the needs of many users, not just buyers and operators.

In the process of uncovering functions, particular attention is paid to noticing problems and opportunities, potential or actual, that arise as the functions are performed. Insights are gained here into why things work or don't work well. These, along with ideas for what to do about it, are collected and written up in documents called *design factors.* Associated with the functions for which they were observed, they become a major resource for the synthesis phase of planning yet to come and for other development and manufacturing stages downstream in the project.

Design factors record the qualitative information most useful for planning and design. This is where the results of critical observations and research studies are crystallized and built into the information base as a part of the collective memory for the project. Essential during the project as the bases for ideas, they continue to have value through the life of the product (and its follow-on adap-

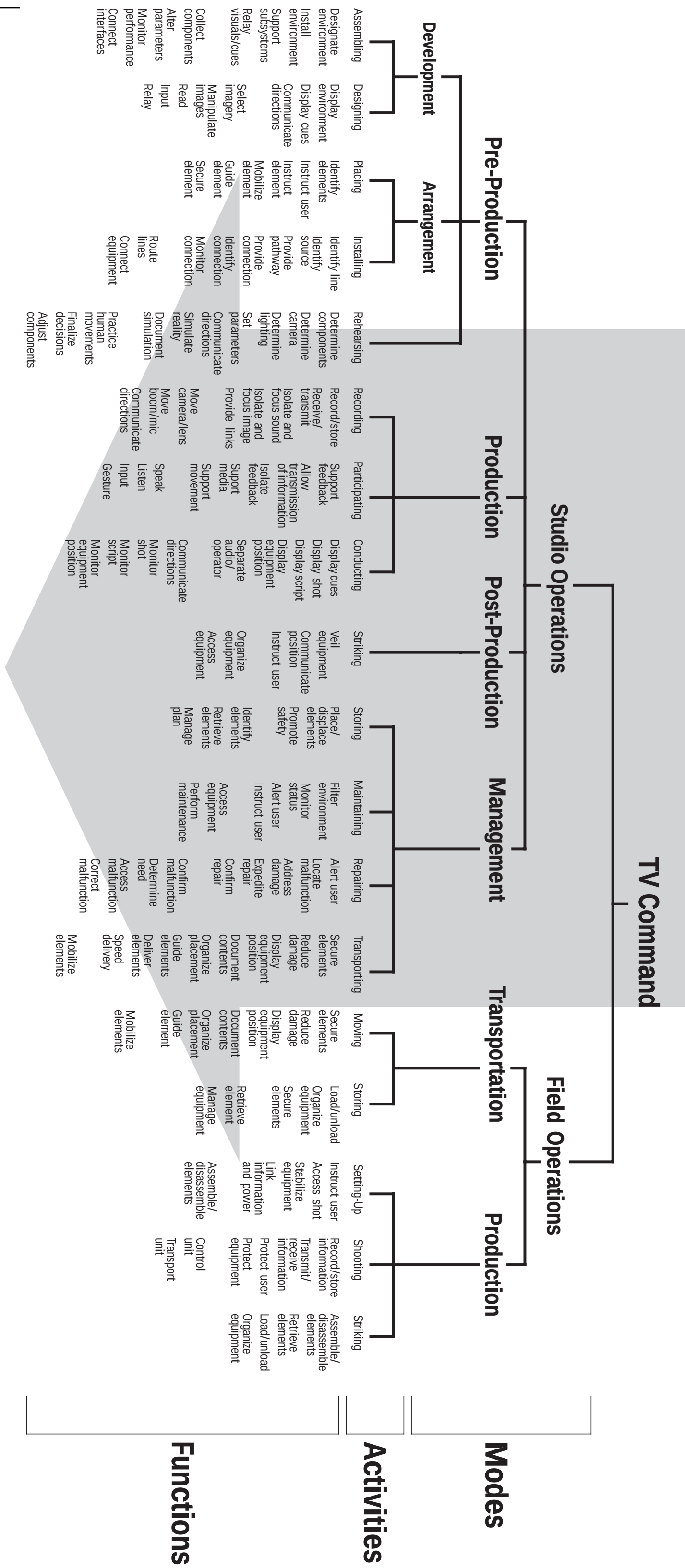


Figure 7

Action Analysis Top-down analysis of functionality for all users.

Design Factor | Title: Selective Filtration | 14

Originator
Eduardo Sciammarella

Project
TV Command

Mode/s
Production

Activity/ies
Recording

Source/s
1. Personal observation.
2. Interview, staff, CBS Chicago TV Affiliate, September 15, 1991.

Associated Functions
Isolate and focus sound
Isolate and focus image

Observation
Because a normal studio recording event requires many participants and a wide range of equipment, what is intended and what actually takes place are sometimes at odds.

Extension
It is the goal of the director (as well as all involved) to produce images and sound according to the script. Achieving a continuous flow of images and sound without error reduces costs, improves working efficiencies and produces a better final product.

There are significant variations in the way television programs are recorded. Some are highly-crafted, polished productions; others strive for immediacy and are direct and raw. Each kind of production requires its own controlled "filtration" of the potential actions of personnel and movements of equipment. For a high-end production, a sound boom drooping into the frame is simply not allowable; another program might use such "human" errors as signatures of the show.

Covering the entire style range, unfortunately, means accommodating the strictest requirements. Cameras must be able to move freely, unobstructed by floor-laid cables and improperly placed equipment. Lights must track fluidly and maintain positions rigidly. Operators must move inconspicuously, without noise and without intruding shadows. Microphones must anticipate movement and maintain relative position without entering the frame of action. The key to all of this is organized communication -- the right information to the right person at the right time.

Design Strategies
- Reveal critical positions
- Anticipate movements
- Sense and signal script change
- Control extraneous noise

Speculations
- Equipment Cartographer
- Shadow Cues
- Eye Tracker
- Surface Pixels
- Electronic Sound Canceling
- Digital Image Filtration

Design Factor | Title: Remote Movement Coordination | 17

Originator
Charles Owen

Project
TV Command

Mode/s
Production

Activity/ies
Recording

Source/s
1. Morgan, C. T., J. S. Cook III, A. Chapanis and M. W. Lund. **Human Engineering Guide to Equipment Design.** New York: McGraw-Hill, 1963.
2. Sheridan, Thomas B. *Supervisory Control of Remote Manipulators*. In **Advances in Man-Machine Systems Research,** Vol. 1, edited by William B. Rouse, Greenwich, CT: JAI Press, 1984.

Associated Functions
Isolate and focus image
Isolate and focus sound
Move camera / lens
Move boom / mic

Observation
For remote control of cameras, microphone booms and lighting, operators must be able to construct artificial perceptual spaces and move objects within them with confidence.

Extension
Moving cameras, microphones and lighting *remotely* is a potentially difficult task, subject to serious mistakes and imprecision unless careful attention is paid to the human factors attendant on indirect control.

Where human operators will themselves control the movements of cameras, booms, etc., the control devices should as much as possible move like the objects being controlled. "A major requirement is that a control move in the *expected* direction, producing a machine or display movement in a similar direction... For precision, a single control moving in 2 or 3 dimensions is better than separate ones, each moving in one dimension" (Morgan, et al 1963, 263).

If a human operator might become too busy, fatigued or bored, it may be appropriate to go to a level of computer-mediated supervisory control. In this case, "...the computer does not provide one function or one form of mediation, but many — at different places in the system, at different times or under different circumstances. ... from the human operator's viewpoint the change to being a supervisor is always a change from continuous and direct sensing and control to indirect or somewhat remote control. The change means observing more integrated displays and issuing subgoal or conditional commands, all at a higher level than with continuous control" (Sheridan 1984, 135).

Design Strategies
- Reveal critical positions
- Anticipate movements
- Create virtual control environments
- Delegate control

Speculations
- Equipment Cartographer
- Script SpotLight
- Eye Tracker
- Viewpoint VR Mask
- Assignment Supervisor
- Robotic Equipment Director

Figure 8
Sample Design Factors.

tations) as the underlying information upon which the design was based. With similar design factors from other projects, they define a major new form of corporate memory—a record of insights applicable to any project with similar aspects of function. Figure 8 shows two typical design factors, one (left) capturing a general insight; one (right) introducing ergonomic information critical to the kinds of control problems anticipated for the television production system project for which it was written.

The *Design Factor* document contains a number of entries. Most important, however, is information of two kinds: *information about the problem (or opportunity) detected*, and *information about what might be done about it*. The fact that problem and solution are both covered in the same document is not accidental. It is important, that when insights are recognized, ideas be sought for how to use them; and it is important that, when insight information is retrieved at a later date, the range of ideas expressed when the insight was gained be there for further reflection.

The "Observation" section is the first of two sections dealing with a problem / opportunity. An observation is a sentence in which an insight is recorded about a function. As much as possible, it distills the essence and summarizes behavior important to understanding what happens as the function is performed.

Associated with the observation section is an "Extension" section. In this section, explanatory material is included to extend or develop the information of the observation. No matter how thoughtfully worded, a summary observation is seldom able to convey enough information to adequately develop an insight. The *whys* that are inevitably asked are addressed in the extension. Primary research may be introduced; background material may be discussed; examples may be cited; contributing phenomena other than those mentioned in the observation may be mentioned; side effects may be considered. After examining the extension section, a reader should understand the design factor, appreciate its value, and even anticipate how the insight might be used—the subject of the following "idea" sections.

"Design Strategies" is the first of two sections dealing with solution ideas. By definition, design strategies are generalized suggestions for how to use the information of the observation and its extension. For a format, they take an imperative verb phrase, carefully crafted to abstract a strategy without specifically describing a solution idea.

Specific ideas go into the "Speculations" section. Speculations are speculative solutions, so named to make it clear that they need not be used in the final overall concept. They are important for determining interaction among functions in the structuring phase of the process—and may actually be used in the overall solution—but, at the time they are written, they are immediate reactions to insight, capturing the creative thoughts of the moment. For a format, they take a noun phrase. Noun phrases express concepts well and are easy to remember—especially if they include colorful phraseology. A good name for a speculation combines an adjective and a noun in an evocative title. Such a title, once explained, is readily retained in memory, and a wealth of detail associated with the concept usually is recalled with it.

Other sections on the design factor form serve the needs of the knowledge base. The "Originator" section records the author of the Design Factor. "Associated Functions" tie the design factor to the functions for which it was written. A "Title" names the design factor for retrieval. Entries in "Source/s" follow standard footnote format, and extension entries contain footnote indicators where appropriate. If the information is from the originator's direct observation or personal experience, the source entry is "Personal observation."

Structuring

Phase three of structured planning is concerned with organizing the functional information for synthesis. The function structure produced by the top-down analysis of phase two is ideal for uncovering what has to be done; *but it is fatally flawed as a model for creating a new concept.*

Because it was created by establishing categories and filling them downward, the function Structure produced by action analysis inherently inhibits cross-category thinking. In the analysis of a housing system, for example, functions such as *sense fire* and *recog-*

nize intrusion would show up in separate categories—probably under Fire Protection and Security. For synthesis, this isolating form of organization is counterproductive. A better organization would be one in which functions are placed together on the basis of whether they *have potential for using components of the developing system in common*. In the housing example, an infrared heat sensor able to detect a developing fire might also be used to sense an intruder, suggesting that the two functions should be considered together when ideas are being developed. Cross-category thinking is stimulated by this form of organization, and the potential for holistic, multifunctional ideas is increased significantly—with all that means for products that are hard to copy.

In the structuring phase, structured Planning's computer programs work from the bottom up using the hundreds of ideas already generated to reorganize the functions into an *information structure*. This hierarchy of functions (with associated design factors) is especially well suited to the creative needs of the planning team. The reformed clusters cross former categories, and functions can appear in more than one cluster. The information structure naturally anticipates well-designed artifacts and institutions.

Synthesis

A number of techniques exist for expanding team creativity. Many of them can be used in this phase. Because of the attention given during the action analysis phase to collecting ideas as they occur, there are typically hundreds of ideas already available to the planning team. Because the structuring phase has organized the functions into an information structure optimized for design, there is a "road map" to follow while considering them.

One of the more useful synthesis tools is a bottom-up / top-down procedure that employs means / ends analysis and ends / means synthesis. Working from the bottom up, means / ends analysis helps the team to understand the new organization of functions through finding appropriate labels to describe the branches of the information structure. Working downward, ends / means synthesis helps the team to select, refine, modify, and invent ideas as the "means" to meet the needs inferred from the newly-labeled "end" branches. Always encouraging thoroughness and pointing the way to cross-functional innovation are the functions, with their associated design factor insights that terminate each branch of the structure.

Communication

Invariably, the result of the synthesis phase is a substantial number of innovative, highly interrelated ideas. To extract full advantage from this wealth of material, the ideas must be organized for optimal communication to those responsible for the next stage of development. At the end of the planning stage, the product is still a concept; many details must be resolved creatively in the designing stage before it can be produced.

The concept is communicated as a plan made up of an overview and many system elements, each describing one or more ideas. The overview presents the major elements of the concept and their relationships. Each system element has a title and four information sections. First is a list of essential features—what the system element (whether a physical, procedural, or organizational idea) must have or do to achieve its value. These must be stated carefully to make sure that the essence of the planners' idea will be retained without overly constraining the freedom of the designers. Second is a thorough discussion of the idea with illustrations, calculations, examples, and any other support that may be useful. The purpose of this section is to present the idea as fully and clearly as possible. If the designers are unable to develop a better idea, they should be able to refine one from the information in this section. The third section lists related system elements that are closely associated in operation or purpose, providing a hypertext-like mapping among the ideas for a better understanding of the plan. Finally, the fourth section lists the functions fulfilled by the system element. This enables designers and decision makers to track ideas back to the activities and design factors describing the original problems, opportunities, and insights that inspired them.

Escalator Delivery

Like it or not, the pace of new product introduction will not slacken. And serious competition will effectively curtail long product life spans. Although structured planning can significantly extend a product's life by fostering high levels of innovation and distributing design features systematically, all products are vulnerable over time. Companies with fast reaction strategies bring down competitors' products by reverse engineering them, and getting to market quickly with low-cost, patent-evasive alternatives made possible by minimal development costs.

The *design strategy* for development pits higher quality products that are more innovative and difficult to copy against the fast reaction strategy. *Escalator delivery* adds another dimension, to give the design strategy a one-two punch. Made possible by a reformed development process, escalator delivery (fig. 9), also is a strategy for fast delivery. It is not, however, a reaction strategy—it is a parallel development process.

At the heart of escalator delivery is the concept of advanced planning teams. Advanced planning teams are small teams of individuals assembled from relevant functional units, supported in their tasks by development, and guided by planners trained in structured planning team techniques. Borrowing from a naval analogy, mem-

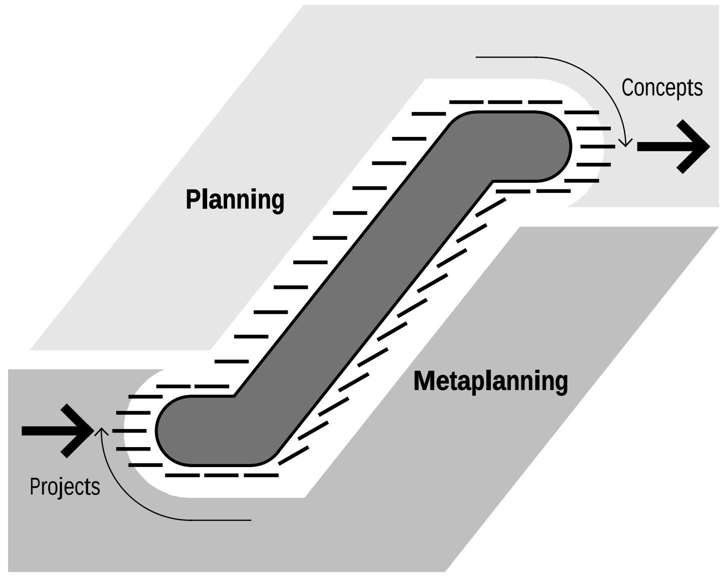


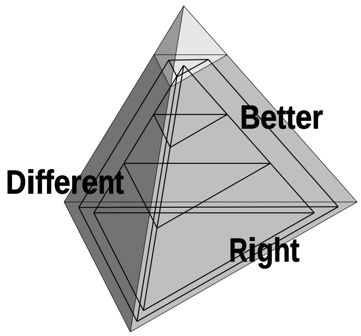
Figure 9
Escalator delivery, Predictable delivery: reliable innovation.

bers of a team are members of a task force. They are "on loan" from their regular type commands, to which they return when their task is completed.

While temporarily assigned to an advanced planning team, members are responsible for the development of a concept for a new product, system, or service to be produced. When their task is completed, they return to their functional units as champions of the project. They (and those that follow them to other teams) also bring back to their functional units new cross-discipline skills and a broader knowledge of their organization's resources, development capabilities, and philosophy.

Escalator delivery gets its name from the process by which advanced planning teams are assembled, charged, and deployed. Through the metaplanning process, planning projects are conceived and initiated continuously, drawing widely on the human resources of the organization's functional groups for the makeup of teams. Once begun, the process delivers new concepts at a predictable frequency. Given similar planning timetables, deliveries follow each other in the same frequency that projects were initiated, no matter how long the planning takes. The process resembles an escalator, with new concepts following behind each other at a predictable delivery rate. The effect is to have new concepts available just fast enough to defeat fast-reaction competitors. Just as the competition successfully brings its copy into the market, its target is obsolete, replaced by a new one more conceptually advanced.

Figure 10
The Quality Pyramid.
Better products through sound *design strategy.*



Conclusions

Design, fortified with appropriate tools, can contribute much more significantly upstream than downstream in the development process. International competition has proven this, and the recent worldwide recession heightened sensitivity considerably. Design now is recognized as the upstream resource most likely to keep organizations competitive under the new economic realities.

A design strategy contains elements to speed development, add value, and extend product life spans. To speed development, fast prototyping and escalator delivery contribute swift response to changing conditions: fast prototyping collapses both planning and designing time; and escalator delivery supplies innovative concepts predictably and reliably. Adding value requires getting the details right. Human-centered design, directed through structured planning ensures that the product is well designed for people and well conceived in the first place. Extended product life span is the natural result of the systemic approach of structured planning.

Evidence is becoming available that the value of the design strategy is being recognized. A recent issue of *Trendsetter Barometer*, a U.S. business newsletter, provides encouraging news: "Breakthrough" revolutionary products have created sales booms for companies that produced them.[3] Of the fastest-growing companies in the U.S., more than one third launched breakthrough products in 1995 and 1996. Collectively, the revenues of these companies soared 1,850 percent over the last five years. How did they achieve this success? First, by innovating revolutionary concepts: a majority applied new technology; forty-seven percent found new uses for existing technology. Second, by organizing themselves to implement a design strategy: the greatest number of successful ideas, thirty-three percent, came from team-oriented research and development processes; almost as many came from cross-functional teams or think tanks.

Reforming the development process enables the philosophy of product integrity embodied in the quality pyramid model, adding value for individual, institution, and society.

From design core to capstone and cladding, the quality pyramid links quality to design. Structured planning implements the model to produce concepts that are superior by design:

- *Different*—freshly imagined to match the best of new technology to emerging needs and interests,
- *Better*—thoroughly and systemically thought through for all users, and
- *Right*—sensitively positioned to meet environmental, personal, social, and cultural needs.

3 David Young, "'Breakthrough' Products, Services," *Chicago Tribune* Business Section (February 17, 1997): 3; compiled from Cooper's and Lybrand's (now PricewaterhouseCoopers) *Trendsetter Barometer*.

The strategy is straightforward; tools to implement it are available; and the road to reform beckons, urged by both competition and opportunity. The rewards will go to those who commit. But the commitment required is more heart than purse. Of all the resources necessary for business or institutional success, the least costly is design. A design strategy, implemented with information-age tools, is a blueprint *today* for success.

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