

**The PDQs of FAST: SIMPLIFYING FUNCTION ANALYSIS FOR
CONSTRUCTION VALUE STUDIES**

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Roger is VE Site Coordinator and Associate Division Leader for Plant Engineering at Lawrence Livermore National Laboratory. He is responsible for coordination of all Laboratory VE activities, conducting in-house VE studies and monitoring studies performed by VE consultants. Roger is Southwest Region Vice President of SAVE.

Roger was Chief Mechanical Engineer at Fredriksen Engineering, has designed air pollution control systems and developed remote sensing methodologies, and has published papers on value methods and air pollution measurements. He has a BS in Engineering from UCLA.

ABSTRACT

Three ways to facilitate FAST diagramming in construction Value Engineering (VE) studies are described. "Project-FAST", "Dormant-FAST" and "Quick-FAST" are explained by examples that illustrate how the problem-solving capabilities of Function Analysis can be derived even from shorthand versions of FAST.

INTRODUCTION

The "ABCs", or fundamentals, of FAST have adequately been spelled out by others (see References). To learn the fundamentals of Function Analysis these authorities and other writings in the VE literature should be consulted. The "PDQs", or shorthand versions, of FAST are three techniques which are offered as ways to apply FAST to construction VE.

OPPORTUNITIES WITH FAST

Function Analysis is sometimes minimized or even omitted from construction value studies. Typical reasons are: *It is only a building or, It takes too much time.* But Function Analysis is capable of illuminating even routine projects and finding the unique characteristics (functions) which drive designcost. Function Analysis can help address questions like:

- Is the building or facility needed at all?
- Is it the right building or facility?
- Does it meet all the functional requirements?

But, more importantly, functions prepare the value team for creativity. They bridge the gap between the Information and Creative phases of a VE study. As Miles wrote, *The language of function is the language of the heart of the problem.*¹ Leaping the gap between Information and Creativity fails to deal with the heart of Value Analysis (VA). If Function Analysis is the bridge, FAST is one of the essential tools needed to build that bridge.

Creative brainstorming "by function" is superior to the "by discipline" method frequently used, because:

Functions return the VE Team to the beginning of the design process, when the designer was choosing a method of accomplishing the client's wants and needs.

Functions reduce the tendency of the VE team to second guess the designer when focusing on basic or support functions rather than the present design solution.

DIFFICULTIES WITH FAST

Difficulties are encountered in applying FAST to construction projects because:

- It takes *time* to do FAST properly and completely
- It takes *training* to master the FAST technique
- It takes *experience* to become confident that FAST will work in construction projects.

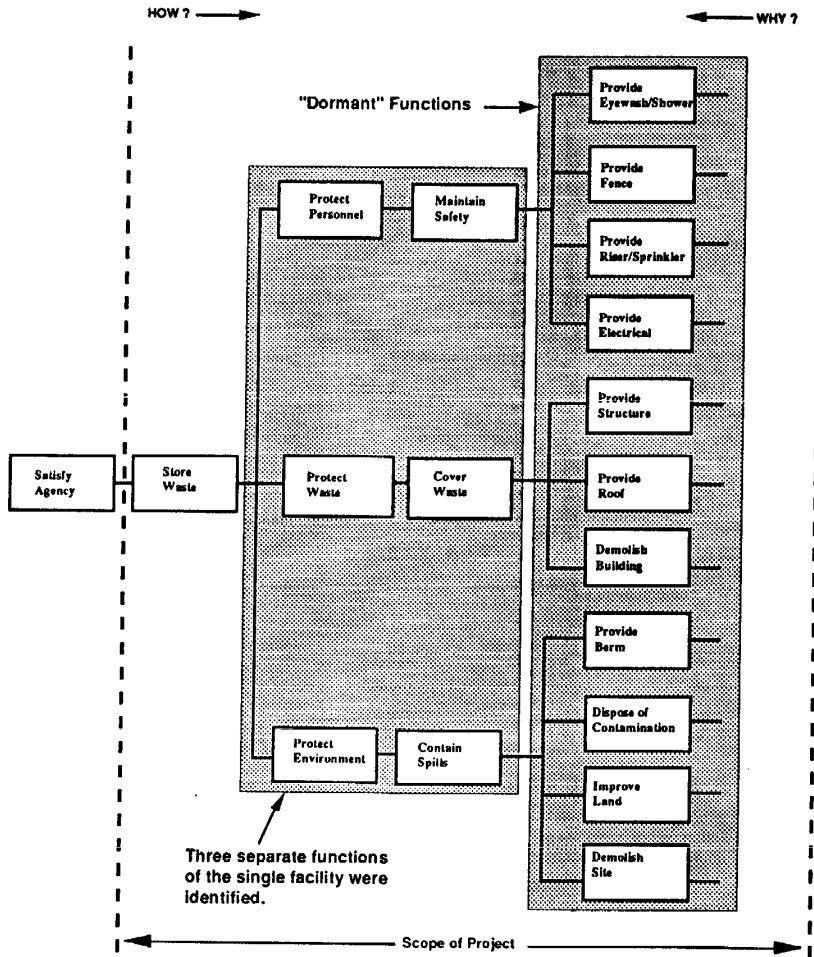


Figure 1
"D - FAST" Diagram
Waste Storage Unit

Figure 2
Waste Handling Facility
"P - FAST" Diagram

Time

One difficulty with the FAST technique is the expectation established by the acronym "FAST." It implies a *fast* way to do Function Analysis. While FAST may shorten some problem solving processes² it is acknowledged that a FAST diagram requires up to many hours to complete depending on the complexity of the problem and skill of the preparers³.

As value team leaders we understand that the Creative Phase takes time to allow ideas to emerge in a small multi-discipline group. While we understand the importance of waiting for ideas to be expressed in an open environment, we fail to allow the same time for FAST. It seems easier to leap the gap to creativity, which is perceived as a simpler task than diagramming functions. By using shorthand FAST methods perhaps we can apply it more uniformly.

Training

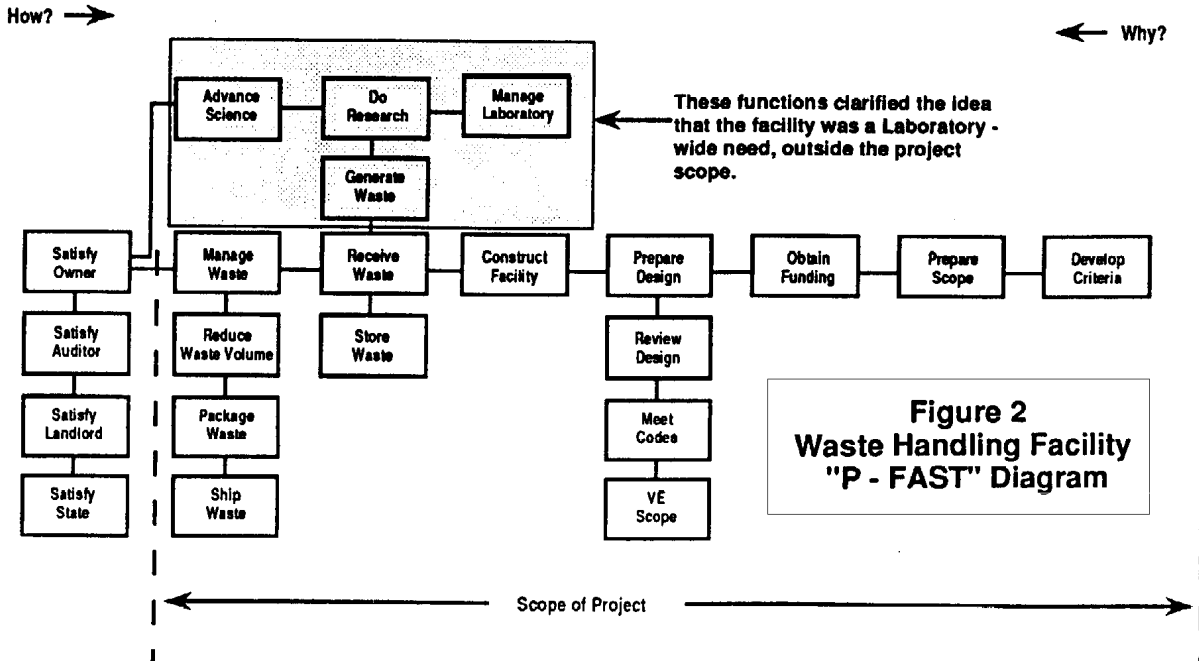
FAST is a road-map of functions⁴, a How/Why/When logic diagram. It is not a difficult process, but one that requires patience. If too many VE team members are not trained in the application of FAST it can become a team leader's exercise with

the group merely observing. Not wanting to make the VE study into a VE workshop we leap ahead, perhaps leaving a partially completed FAST diagram as food for thought. But then we fail to extract the value from the diagram and do not allow FAST to guide the functional thinking and creativity of the team. Also, we sometimes fail to recognize the importance of doing a FAST diagram that fails to reach a preconceived result.

There are many interpretations of FAST. Over time the tendency has been to add subtle changes, making the process increasingly complex. The fundamentals of FAST are few; there is consensus:

- Active verbs and measurable nouns in boxes.
- "Hows" read to the right; "Whys" read to the left
- Basic Function is inside left scope line
- Higher Order Function is outside left scope line
- Starting Function is outside right scope line

Nothing else is needed to construct a FAST diagram; other refinements are not essential for good results.



Experience

The first time we attempt to lead a value team in developing a FAST diagram we lack the background to achieve full utilization of the technique. But the more we use FAST the more opportunities we have to experience its effectiveness. We learn that there is no perfect FAST diagram, no correct answer; each unique team will produce its own unique FAST for a given project. With time we learn, as Parker said, that FAST "corrects the ignorance factor and opens the door to greater creativity."⁵

As Kaufman said, a problem has many dimensions⁶. To attempt FAST at all possible levels is impractical. Rather than push the level of abstraction or indenture down to deal with numerous building systems, it is more practical to raise it. We should not fail to do FAST because the large number of building systems overwhelm the value team. As Parker suggests we can do several FAST diagrams to represent different points of view.⁷

These general difficulties could be remedied by some simpler short-hand ways of applying FAST. Three such methods, and how they evolved, are described below.

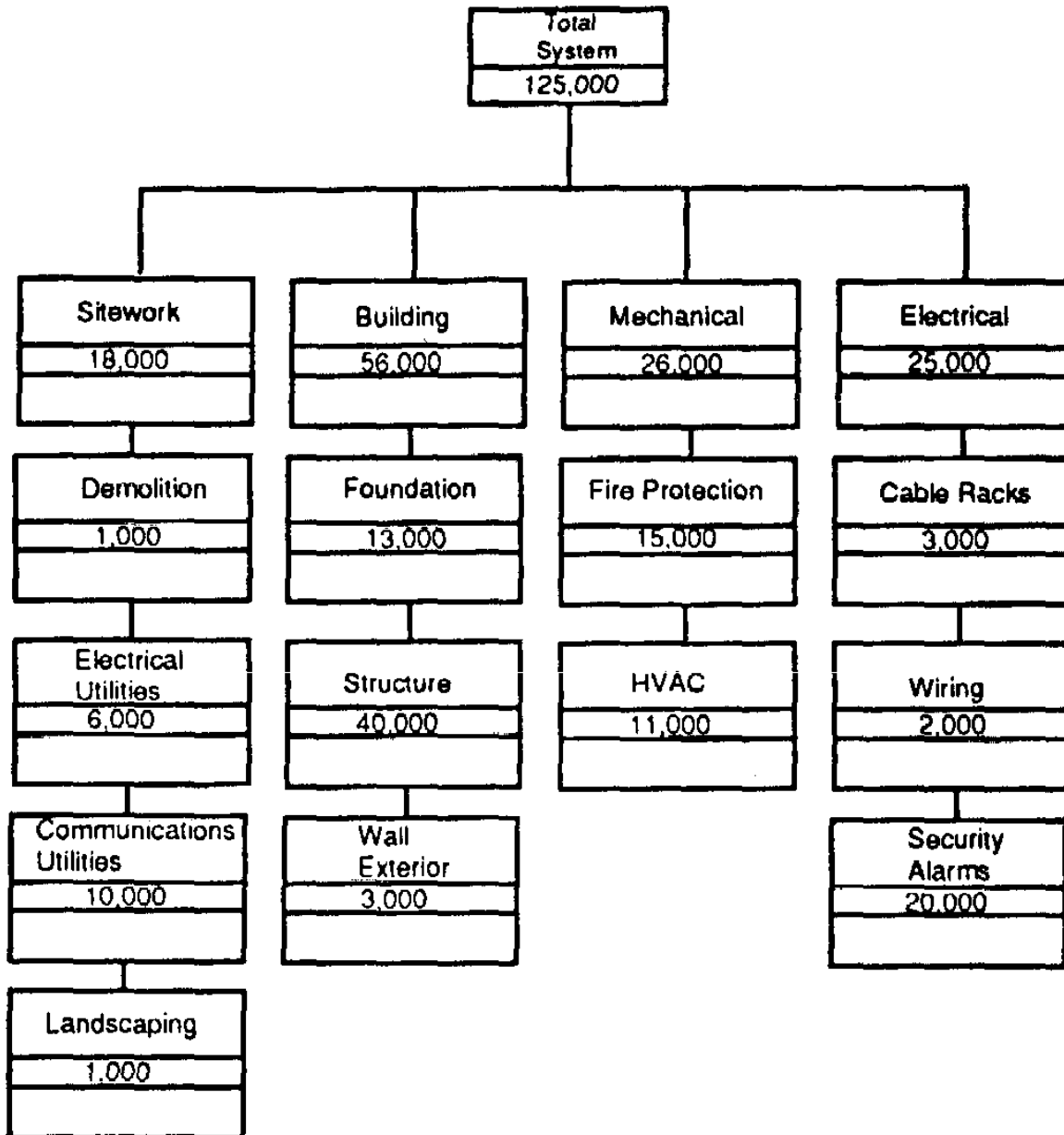
FAST and VEST

The PDQs of FAST grew out of the need to incorporate Function Analysis into short scoping VE studies where none of the team members are VE-trained. VEST, VE at Scope Time^{8,9}, is VE applied at the scope phase of a project with the design team and client as the value team. The primary goal of VEST studies is to clarify the project scope. Because they are one-to-two-day studies the emphasis is on the Creative and Evaluation Phases; fully-costed VE proposals may not be developed. Therefore, time is usually not available to teach Function Analysis. The problem is how to accelerate the Function Phase so that it can be used in any value study where team members are unfamiliar with the technique.

One way is for the Team Leader to prepare the FAST Diagram as a personal exercise. This will get the diagram into the report but not into the minds of the team members. It will fail to influence the study process except to clarify functions in the mind of its creator, the team leader.

Other ways, called here the "PDQs of FAST", evolved in different VE and VEST studies to help prepare value teams for the Creative Phase. The "PDQs of FAST" are defined and described by example, starting with "D-FAST", continuing with "P-FAST" and concluding with "Q-FAST."

Figure 3 Cost Model Communications System



"D-FAST"

"D-FAST" is from *Dormant*: "Latent but capable of being activated"¹⁰

"Dormant-FAST" is the result of what might be considered an incomplete or failed attempt to complete a FAST diagram under the time pressure of a VE study. However, we should be

content to let the FAST process take us through the functional discussion of a project without requiring a finished diagram as the goal. As Bytheway said, "FAST is a *thinking process*, you can throw the diagram away."¹¹

We can allow enough time for the FAST diagram to be built by arranging functions along the critical path and listen for team input that clarifies basic and supporting functions. An example of "D-FAST" for a Waste Storage Unit (WSU) (Figure 1) shows the Basic Function ("Store Waste") followed by three

Supporting Functions: "Protect Personal, Waste and Environment." These in turn have Supporting Functions, which are then branched to Dormant Functions.

This "D-FAST" was abandoned in favor of moving to the Creative Phase. But the effort was not wasted. This latent function analysis served to validate basic project functions even if it was not used to complete cost-worth or function-worth determinations. Specifically, the three "Protect ..." functions illuminated the fact that there was more than one purpose for the WSU and that all three needed to be satisfied equally. This effort broadened the Creative Phase and resulted in a reconfiguration of

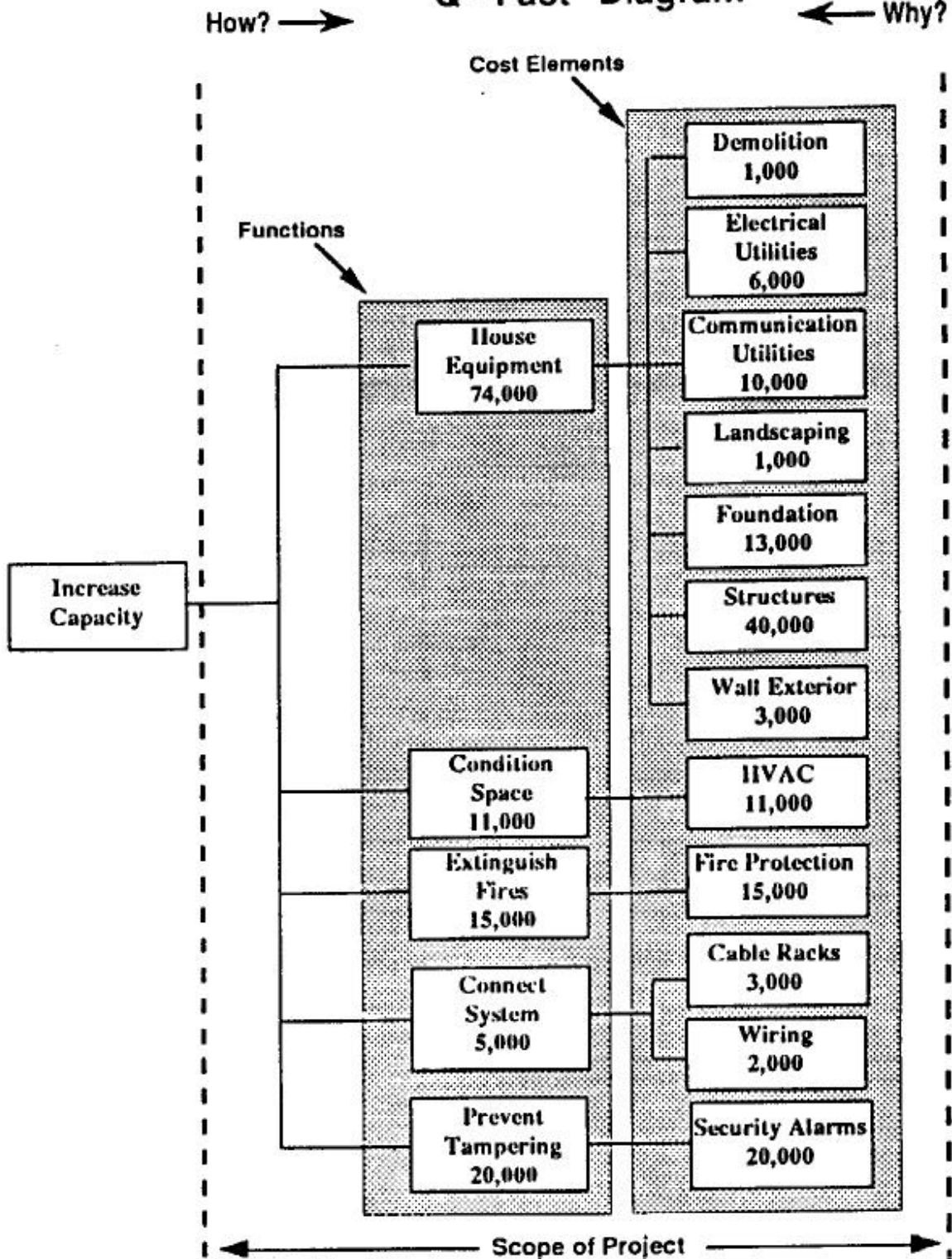
the WSU, using a new concept not thought of prior to the function analysis. "D-FAST" can bridge the gap between Information and Creativity.

"P-FAST"

"P-FAST" is from *Project*: "An undertaking requiring concerted effort"¹².

"Project-FAST" is what Snodgrass and Kasi call a Task

Figure 4
Communications Systems
"Q - Fast" Diagram



FAST,¹³ or what Fowler calls a "User-Oriented" FAST.¹⁴ It has only a few functions stating "How" and "Why" a construction project is to be carried out. This sometimes follows the D-FAST effort (see above) where a frustrated team has struggled with the whole array of specific functions or project elements, only to find a simpler diagram can emerge if they change their role, or point of view.¹⁵

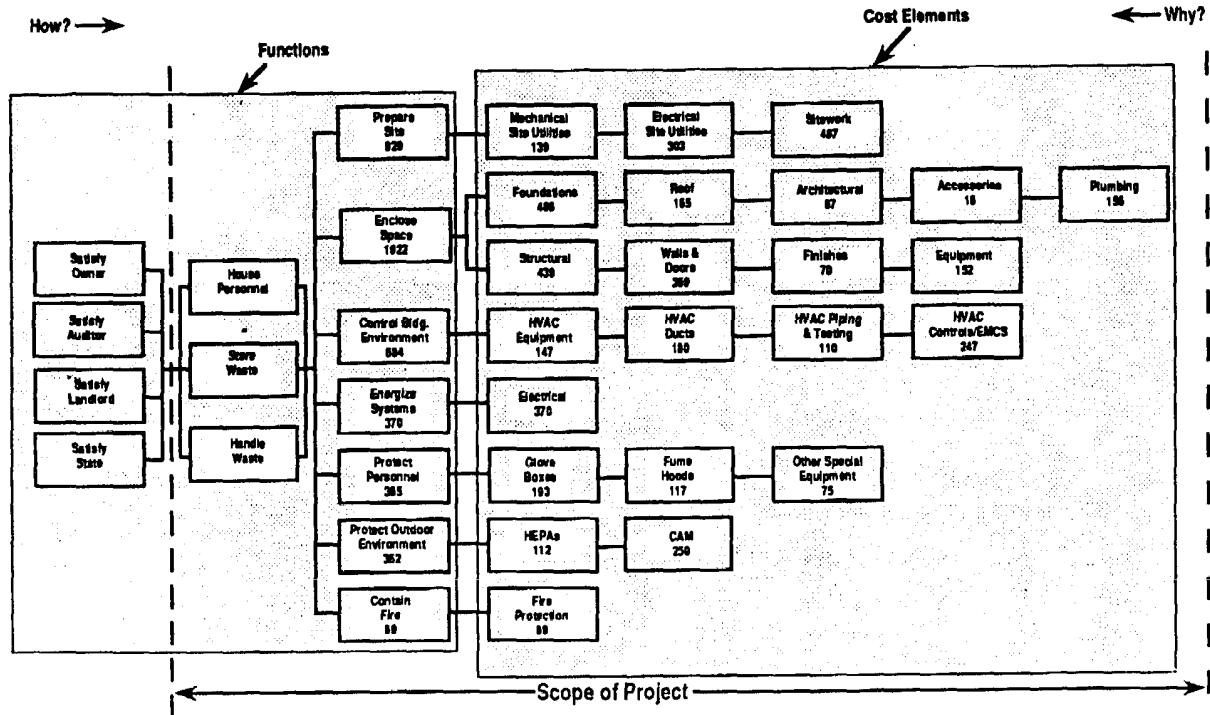
"P-FAST" is a higher level of abstraction, or indenture, dealing with general functions of the project, not specific functions of the facility. Its Higher Order Function may be "Satisfy Client"; The Starting Function may be "Determine Needs."

to a Cost Model¹⁷, the reverse is also true.

In an "Aha" moment of insight new boxes were created to identify the basic functions of the building elements, such as "Control Environment" and "Enclose Space." The Cost Model boxes became arranged in functional clusters. For example, "Extinguish Fires" had only one associated cost model element (Fire Sprinklers), whereas "House Equipment" had several elements, such as "Demolition", and "Electrical Utilities."

The key to "Q-FAST" is the resorting of all cost elements by function. The building systems became associated with the functional statement which expresses what the elements are doing in the project. The conversion from thinking about cost

Figure 5
"Q - FAST" Diagram
Waste Handling Facility



An example of "P-FAST" for a Waste Handling Facility (WHF) (Figure 2) clarified the mission of the WHF. The upper branch shows that the WHF serves as a site-wide receiver and manager of laboratory wastes. The lower branch of the "P-FAST" displays the activities needed to obtain funding, and design and construct the facility to "Satisfy Owner, Auditor, Landlord and State." This "P-FAST", while entirely different from the "Q-FAST" on the same WHF project (Figure 5), does help bridge the gap between Information and Creativity.

"Q-FAST"

"Q-FAST" is from *Quick*: "Achieved in a brief space of time."¹⁶

"Quick-FAST" is a method which uses the Cost Model as a starting point. Cost Models and FAST diagrams are both arrangements of boxes containing words and numbers. While struggling to create a FAST diagram for a small communication system project the interrelationship of the two diagrams become clear. By dissecting the Cost Model (Figure 3), that is, cutting the paper boxes out with scissors, they were rearranged on a table. Moving the small pieces of paper around destroyed the Cost Model paradigm and allowed a new paradigm, a FAST diagram (Figure 4), to emerge. While a FAST diagram can be converted

elements grouped "by discipline" to functional groupings suddenly changed the awareness of what functions cost rather than what building elements cost.

One way to implement "Q-FAST" is for the CVS team leader to prepare a draft of the FAST diagram before the study. Cost Models are often prepared by the CVS team leader before the VE study to expedite the study process. In the same way, by developing a "straw man" "Q-FAST" diagram the team leader can help the value team to learn and employ Function Analysis. It is not introduced into the discussion until after the team has listed basic and supporting functions. When shown to the team the "Q-FAST" diagram is used as a discussion document for adding/deleting functions and affirming which are basic/supporting. The value study then proceeds with the consensus "Q-FAST" diagram to select functions for the Creative Phase.

An additional "Q-FAST" example (Figure 5) shows three basic functions ("House Personal", "Store, and Handle Waste") and seven supporting functions followed by 23 "unfunctionalized" cost elements. One advantage of this "Q-FAST" diagram over the Cost Model is that it is easy to compare costs of functions and at least do mental worth estimates. "Q-FAST" bridges the gap between Information and Creativity.

SUMMARY

1993 SAVE PROCEEDINGS

The credibility of Value Engineering depends on professional application of the prescribed steps in the VE Study Plan including Function Analysis. New ways to facilitate the use of Function Analysis, such as "P-, D- and Q-FAST", can help overcome the resistance to its use and bring more value studies into compliance with SAVE's standard recommended practice. It is hoped that these suggested shorthand FAST diagrams will find some application in construction VE studies. Others are encouraged to seek their own FAST methodologies and to take the high road to creativity by allowing FAST to bridge the gap.

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