

THE POWER OF FAST IN VALUE MANAGEMENT

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ABSTRACT:

The success of a company is not dependent on innovative product alone. To be successful a company must learn creative organization concepts that will help them react quickly and effectively to business opportunities. Function Analysis System Technique (FAST) is a powerful analysis process used by most Value Engineers to analyze the functions and reduce the cost of physical components, assemblies, hardware products and construction projects. However, FAST is an excellent innovative process for business systems and planning activities. This paper focuses on the "soft side" of Value Management (VM) and how to use FAST, an effective mapping technique, to extend VM beyond products or construction applications into the management of a business.

The objective of this presentation is to demonstrate the diversity of FAST rather than present a tutorial on its principles. An overview of the FAST process is provided as a backdrop for the innovative process presented. However, it is assumed that the reader has a basic understanding and working knowledge of FAST and function analysis.

1. INTRODUCTION

The accelerated advancements in communication technology over the last 20 years has dramatically increased competitive pressures by reducing the available time from concept to market. No longer can organizational units operate in an isolated sphere judged on provincial performance standards. Time to market, market share, profit on sales and growth depends on the effectiveness of interdisciplinary cooperation among dissimilar organization disciplines, focusing on a common vision, the success of the business.

FAST has proven to be an excellent planning tool and a way to present complex concepts in a logical business case form to senior management. A primary rule of the FAST process, disciplining the team participants to describe functions simply, using active verbs

and measurable nouns, is the key that makes multidisciplined teams work. The verb-noun rule acts as a common language resulting in effective communications across diverse disciplines. This allows Marketing to communicate with Product Development, the physicist to functionally explain his ideas to the purchasing agent, and Finance to relate the economic consequences of design decisions to the design engineer.

FAST is not an end product or result, but rather a beginning. It opens the subject under study, forming the basis for a wide variety of subsequent approaches and analysis techniques. FAST contributes significantly to perhaps the most important phase of VM --Function Analysis.

Since its introduction, FAST has been used worldwide in a variety of situations: from Marketing to Engineering to Manufacturing, in new product development and cost reduction, for hardware and software, from the medical profession to state government, for creating procedures, organization development and analysis, and for productivity improvement and training.

In this paper, the subject of FAST is explored from a systems and process approach rather than the more common hardware applications. In fact, exposing the beginner to FAST through hardware examples may prove discouraging because the result and the FAST model may not agree with the "obvious" structure or product under study. The tendency is to then "force fit" the FAST model to the product, instead of questioning the function relationship of the component parts. To the beginner, if the FAST model and the hardware project do not agree it is assumed that the FAST model is wrong. The rationale being that the product must be correct because it exists, therefore the FAST model must be incorrect. The fact that the design configuration may not reflect the best approach to achieve its required functions is not considered an option to the beginner, causing him to lose confidence and shy away from using this most effective discipline.

1.1 Function Dependencies

The major difference between the more conventional VE Random Function Determination and the FAST process is in analyzing a system as a complete unit, rather than randomly analyzing the component parts of a system. When studying systems it becomes apparent that functions do not operate in a random fashion. A system exists because functions form dependency links with other functions, just as components form

a dependency link with other components to make the system work. The importance of the FAST approach is that it graphically displays function dependencies and creates a process to study function links while exploring options to develop improved systems.

Used as a Value Management methodology, FAST translates the goals and objectives of management initiatives into measurable actions. One of the advantages of FAST is in not being bound to a single market, product or process. FAST can be used in any situation where a choice of exploring, creating and implementing new function combinations is encouraged.

2.0 BACK TO BASICS

Before exploring some of the advanced concepts of FAST, a review of the basic principles will help understand the examples and applications in this presentation.

2.1 Intuitive Logic

FAST recognizes function dependencies by asking the intuitive questions "Why?" and "How?" Modeling FAST gives those questions a directional reference. "How" is always read from left to right and "Why" from right to left. These questions form the foundation of the FAST process. The importance of the HOW-WHY questions lies in the answers they invoke. When asking "How" of a function the response is the method to perform that function. When asking "Why" of that function the answer is the goal of that function. Following the "How" path will lead you to a more detailed method analysis as the answers justify the functions of the subject under study. Each "How" question will bring you to a lower and more detailed level of abstraction.

Asking “Why” describes the systems approach, and creates a higher level of abstraction. FAST requires that the team agree with the logic stream in both the “How” and “Why” directions.

As an example, if we were addressing the function "make marks" and ask the question; "How do we 'Make Marks?'" the answer, in the form of a function could be "Contrast Color" (Ref. FIGURE 1). We can also make marks by contrasting texture, as in making marks in the sand, or etching, but to keep the example simple, we will not explore that logic path.

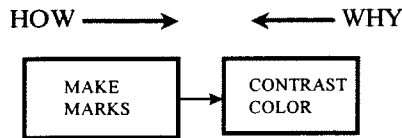


FIGURE 1

If we continued in the HOW direction and ask; "How do we 'Contrast Color?'" one answer would be "Deposit Medium" (Ref. FIGURE 2).

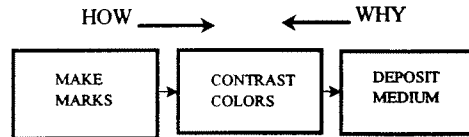


FIGURE 2

To test the intuitive logic of the example we can read the functions in the reverse WHY direction. "Why do we want to 'Deposit Medium?'" To "Contrast Color." Why do we want to "Contrast Color?" To "Make Marks." If the team agrees with the answers we can continue to expand the FAST model, either in the WHY or HOW direction. In the WHY direction we would ask; "Why do we want to 'Make Marks?'" To "Record Data"; and "Why do we want to 'Record Data?'" To "Retrieve Information." Switching to the HOW question we can continue to build in that direction by asking; "How do we 'Deposit Medium?'" By "Applying Pressure." Examining the function inputs thus far, the FAST model would appear as shown in FIGURE 3.

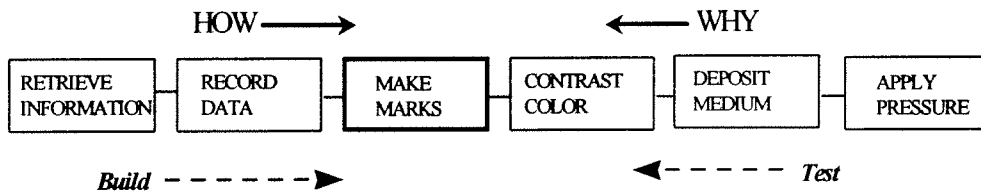


FIGURE 3

2.2 Backward Thinking

The HOW-WHY orientation seems backwards to many beginners of FAST, especially those involved in creating systems

diagrams or flowcharts. This is a valid observation if the principle objective is to create a systems diagram, because the WHY

direction describes FAST in a systems orientation.

Reading the model in reverse of conventional practices is a process used by copy checkers to find text errors. In our case reading from the goal, or the left side of the model, to the beginning, on the right end (in the HOW direction), goes against our system paradigm. Because it seems "strange," building the model in the HOW direction; or function justification, the team's attention will focus on each function element of the model. Whereas, reversing the FAST model and building it in its system orientation will cause the team to leap over individual functions and focus on the system, leaving function "gaps" in the system.

A good rule to remember in constructing a FAST Model is to build in the HOW direction and test the logic in the WHY direction.

2.3 The Language of FAST

The FAST language consists of 5 words and the symbols that define them. The 5 words are; HOW, WHY, WHEN, AND and OR. HOW and WHY were described above and are basic to any FAST model, but using these 5 words to form a universal FAST language is unique to this presentation. A description of the remaining 3 words follow.

2.4 Reading WHEN

The WHEN direction is not part of the intuitive logic process but it supplements intuitive thinking. WHEN is not time oriented, it expresses cause and effect. Referring to FIGURE 4, "When you 'Transmit Information,' you should 'Store Information.'" "Store information" is an independent support function that supplements the function "Transmit Information". As an independent function it can be expanded in the HOW-WHY

directions to build a subsystem FAST model. Since the independent function is not on the major logic path, changing, or eliminating the function would not significantly affect the basic fictions' performances.

An important rule to follow is to always read from the exit direction of the function being addressed to question the 3 primary functions, HOW, WHY or WHEN. The questions will be answered in the corresponding exit box, as illustrated in FIGURE 4.

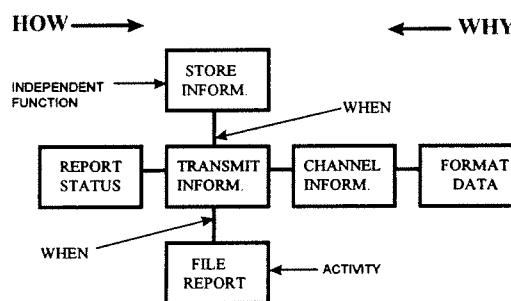


FIGURE 4

The function "File Report" is an activity. Activities are not functions. They describe a specific action that is initiated when the logic path function is activated. In the illustration, it reads .."When you 'Transmit Information' you should "File Report."

Since functions and activities can be described using a verb and a noun, a general rule to distinguish between the two is to examine the noun. If the noun describes something specific like a component or device, it is considered an activity. Nouns that are generic are used to describe a function. Independent functions (above the logic path) and activities (below the logic path) are the result of satisfying the WHEN question.

Activities and functions can appear on the same logic path, as long as the HOW-WHY logic is satisfied. A FAST model that mixes activities with functions makes that model

case specific. If only functions are used to create the FAST model, it will be in generic form. Referring to FIGURE 3, the example, generically expressed in function form, can describe a pencil, typewriter, paint brush, printer, or anything that performs the basic function “*Make Marks.*”

2.5 Moving the Level of Abstraction

The level of abstraction of the FAST model can be moved by relocating activities. Taking activities out of the main logic path and moving them under a related function raised the models’ level of abstraction for macro analyses.

Conversely, incorporating activities into the major logic path expands and details the model, lowering the level of abstraction of the model for micro analysis.

2.6 Reading AND and OR

In many instances, the answer to HOW and WHY could be more than one function response. The answer could be in the form of “AND” or “OR.” The symbol for “AND” is a branch in the logic path and the symbol for “OR” is a split in the logic path showing 2 or more independent logic paths.

As shown in FIGURE 5, reading the AND branch in the HOW direction, “How do you ‘*Confirm Compliance?*’” - by “*Verifying Documentation,*” AND “*Validating Performance.*” Reading the OR split in the HOW direction, “How do you “*Estimate Deliveries?*” – by “*Extending Bookings*” OR “*Forecasting Orders,*” not both.

3.0 A BASE CASE MODEL

A small to medium size company recently learned that their newly introduced product is an unqualified marketing success. The company needs to expand its office facilities to keep pace with the growing business. Space allocated for the production department

will remain approximately the same. Management has decided that detailed manufacturing will be “outsourced,” and the company will focus on the assembly, test and distribution of the new product.

3.1 Forming the Team

The Facilities Department, responsible for the management of capital assets, was requested to assess the expansion needs, and “... do what is necessary to accommodate fully staffed sales and administrative support departments in 6 months or less.” The Facilities Manager opted to form a Value Management Task Team and create a FAST model to determine what has to be done and identify who is involved in implementing the assignment.

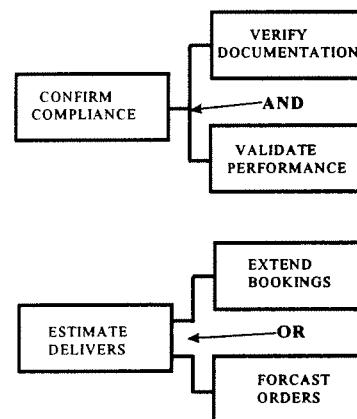


FIGURE 5

The core team of full time representatives included; Facilities, Space planning, the occupying departments, Resource Planning, Security, Safety/Fire and Communications. A support team of part time participants included; Marketing, Procurement, Personal and Information Systems.

3.2 Collecting Random Functions

Following the team management briefing in which the problem, expectations, and constraints were defined, the team, led by an

experienced VM facilitator, randomly identified key functions associated with the assignment, and displayed them in the center of a 3 column chart.

The purpose of randomly identifying functions is to create a “starter kit” of problem related functions to begin constructing the FAST model. A partial example of the display appears in FIGURE 6. After completing the center column the team answers the HOW and WHY questions and fills the appropriate columns. The entry logic was tested by reading across, in row form. As an example, “How do you ‘*Define Space Requirements*?’”- by “*Analyzing Resource Needs*.” And “How do you ‘*Analyze Resource Needs*,”- by “*Forecasting Population Growth*.” The logic must also hold when reading across in the WHY direction.

3.3 Constructing the FAST Model

Each answer under the 3 columns are discrete functions, or activities. When the team felt that they had enough functions to start the modeling process they transcribed the functions on 1 ½ by 2 inch “post-it” notes. These random notes are puzzle pieces used to build the FAST model. Using the intuitive logic rules to construct the FAST model, the random function notes are arranged in a sequential form that satisfies the HOW and WHY directions. Not all function notes will be used in the FAST model. Some may not fit the level of abstraction of the model. Others may support a logic path that is not relevant to the issues, or are discarded because they are not properly worded. Missing functions may be added to the model as needed, to “bridge” a logic gap in the HOW or WHY directions.

The model is considered complete when the members of the core team agree that from their prospective, the FAST model represents

the key issues of the assignment in describing *what must be done*, not necessarily, how to do it.

FIGURE 7 titled “Facility Planning” illustrates the base case FAST model. Although the FAST model and its development used in this example has been simplified to fit the page size limitations of this presentation, it does represent most of the

← WHY	FUNCTION	HOW →
Define Space Reqrmts	Analyze Resource Needs	Forecast Population Growth
(same)	Identify Growth Departments	(same)
Construct space Lease Space Re-arrange Space	Allocate Space	Execute Plan
Accommodate Needs	Occupy Space	Implement Move
Resolve Conflicts	Identify Problems	Rehearse move
↓	↓	↓

FIGURE 6

elements that are common to all planning and process opportunities described in FAST model form. Typically, the size of a FAST model drawing will range from 11X17 inches, to larger engineering drawing sizes. The actual model contains approximately 4 times the number of function and activity blocks. However, the reduced base case model does represent the elements of a business system application using FAST and its principles.

4.0 READING AND ANALYZING THE FAST MODEL

The major logic path is drawn in heavy lines. The remaining model shows activities, or independent functions branching off in the WHEN direction. By definition, the first function(s) to the right of the left scope line is basic. Therefore, “*Implement Move*” is the basic function of the project. Reading in the

HOW direction, 3 choices are given to implement move. "How do you "Implement Move?" by "Constructing Space," OR "Leasing Space," OR Re-arranging Space" or, any combination of choices.

When the team analyzed the FAST model, they agreed that the choice of acquiring the required space needed to be resolved when the space requirements were defined (Ref. Box #14). Viewing and analyzing downstream functions allowed the team to anticipate problems and resolve those issues early. This supported some of the team's "front-end loading" requirements.

4.1 Dimensioning the FAST Model

The next step in the process is to dimension the FAST model. A properly dimensioned FAST model is a powerful management analysis tool. Selecting the right dimensions are dependent on the problem definition, project goals and how project will be measured. Dimensioning makes the FAST model a living instrument. The matrix shown in Figure 7, adds dimensions to the model that best fit the objectives of the project under study. Metrics can also be added if they contributes to the project resolution.

The FAST model is not time oriented, but time can be noted on the model. In the base case (Ref. FIGURE 7) 4 key completion date were identified. The team agreed that if those functions and their associated activities were satisfied by those dates (Ref. Blocks 12, 19, 20, 24), the assignment could be completed in the 6 month (or less) goal.

In business process studies, time is often more important than cost reduction. Time to market, process time, the time value of money, are some key business issues where time is money. In addition to cost and time, FAST dimensions include, but are not limited

to: responsibility, budgets, manloading, expense allocation, determining value added and non-value added functions, process phasing, funding stages, paper work flow, capital equipment assessment, assigning target costs, establishing decision gates, positioning design reviews, and many others.

Returning to the base case, dimensioning provided a "sensitivity matrix" identifying those disciplines, or departments involved in implementing the project. The bold type indicates the core team participants. Note that each block is assigned a discrete number. How the blocks are numbered, in what sequence, or whether to number just the major logic blocks or all the blocks are optional, dependent on the needs of the team. Each block was discussed, analyzed and brainstormed to determine the best way to perform the functions and activities. The team then decided which departments would be "moved to action" as a result of that block, indicated by an intersecting circle. The team also decided which of the involved departments would be responsible for the performance described in that block, indicated by an intersecting dot. Responsibility is one dimension scheme. As discussed above, a great variety of dimensions and metrics can be used and displayed in constructing a sensitivity matrix.

The "Funding Gate" symbol in FIGURE 7 illustrated to the team when and how implementation funds would be available. The model shows that an implementation plan (block #12) is required to justify project funding. In other FAST applications, the "Gate" can represent design reviews, budget approval, or any event where "justification to proceed" is required.

The project used for this base case example achieved the move in 5 months and one week, without major incidents, well within

budget constraints and judged successful by the displaced personal.

4.2 Business Systems Re-engineering and FAST

In Business Systems Re-engineering projects the FAST model has been used to match functions to department charters, determine direct responsibilities for those function and those affected by the actions of the responsible groups. If a major reorganization is called for, a macro level FAST model can be created with a team of cognizant senior managers to determine which functions to protect and which to separate from the organization under study without adversely effecting the performance of that department.

Most budgets are developed and justified by assessing the organizations' level of activities. In terms of FAST, activities are the actions that implement functions. It then follows that by analyzing and identifying the value added function contributions of the organization under study, downsizing can be accomplished by protecting and reinforcing charter functions, while divesting the organization from non-value added activities. VM studies in business systems applications indicate that less than 35 percent of an organizations' budget supports its major, or charter functions. The remaining budget support peripheral activities. Goals can also be assigned to key functions. The dimensioned FAST model will show which goals are independent and which are dependent on other department inputs for their achievement.

5.0 CONCLUSIONS

Major breakthroughs in information technology and the growth of global competition is causing progressive managers to move away from Alfred Sloan's principles of management control and accountability.

As response time becomes a critical competitive factor senior managers are appreciating that bigger is not necessarily better. In its place, the small entrepreneurial spirited business team has the advantage of rapid product development and deployment, at lower cost, accomplished with higher value added ratios than heavy staff dominant competitors.

To achieve this worthy objective requires a process that allows and encourage interdisciplinary team members to communicate with each other to establish a common vision and make that vision a reality. The Function Analysis System Technique (FAST) is made to order as the methodology of choice for this application.

6.0 REFERENCES

- Kaufman, J. Jerry, (1985) *Value Engineering For The Practitioner*, North Carolina State University, Raleigh, NC.
- Kaufman, J. Jerry, "Function Analysis System Technique (FAST) For Management Applications," *Value World* January/March 1983.
- Kaufman, J. Jerry, "Function Analysis System Technique (FAST) For Management Applications," *SAVE Proceedings, 1979, Vol. XIV*, Dallas, Texas, Pg. 147-172
- Park, Richard J., "Function's The Foundation", *SAVE Proceedings, 1979, Vol. XIV*, Dallas, Texas, Pg. 191-197

