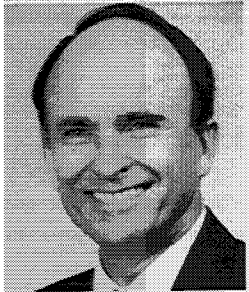


SHIFTING PARADIGMS TO EXPAND CREATIVITY

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ABSTRACT

Shifting from the paradigm of function-based creativity to the paradigm of fact-based creativity expands the number of the ideas generated as well as the alternatives developed by VM teams. As demonstrated in actual studies, team members not fully trained or completely familiar with the value methodology can offer more ideas when prompted by both functional and factual categories. Both paradigms must be used to tap into the two sets of creative ideas in the minds of the team members.

INTRODUCTION

Creativity sessions in value methodology (VM) studies owe their success to many factors. The most important is the use of function analysis as preparation to the brainstorming of ideas. VM theory claims, and practice supports the notion, that more ideas--and better ideas--are generated "outside the box" using functions. Describing the problem in functional terms using the FAST diagram opens the doors of creativity because the old paradigm of thinking about the problem in its factual terms is replaced by a new paradigm: thinking of the problem functionally. Therein lies the power of the value methodology. As Fowler writes, "Creating-by-function is reaching to the limits of the envelop and beyond."¹

While VM practitioners are familiar with the function paradigm as a basic tool in their VM toolkit, some or all of the VM team members may not be able

to grasp the concept of function analysis sufficiently well to make them comfortable during the creative phase. Thus, when the team leader calls for alternative ideas in a random brainstorming session the team members may not respond as fully as expected. This is because they are still operating under their old paradigm of viewing the problem in factual (not functional) terms.

This effect was demonstrated in a series of VM studies. When the end of the function-based creative session was reached the team leader called for more ideas, this time using the categories of traditional engineering disciplines or project elements. The result was the revitalization of the team's creativity and a dramatic expansion of the total number of ideas listed for later evaluation.

CREATIVE SESSION METHODS

VM studies have as their core a creative phase, preceded by information and function analysis phases, in the search for alternatives that will improve value by increasing performance or reducing cost, or both. The typical protocol has the team leader offering prompts to the VM team--such as "Improve Performance"--which are designed to elicit ideas for alternative ways of satisfying the function before them. When function analysis is used these prompts are the simple verb-noun expressions of work to be done to satisfy the higher order functions. They stimulate "outside the box" thinking by directing team members to broader concepts, the "whys" of the project under study. The verb-noun

function descriptors break down the old ways of describing a problem. To borrow words by Steinbeck: we use functions to “look for the answer that is always concealed in language.”² That is, we replace the old concealing factual descriptions with revealing functional language.

The selection of the prompts is crucial to the success of the creative session. They are based on the random function analysis and/or FAST diagram. Experience shows that it is better to give the team several different functional prompts because each person responds uniquely; more prompts means more ideas from the team.

STUDY RESULTS

Eight VM studies of construction projects were conducted with teams of mostly untrained and inexperienced team members led by a CVS team leader. Table 1 lists the number of ideas generated in eight creativity sessions under two conditions: first with prompts in the form of the functions of the project, and second with prompts based on, topics or categories (i.e., facts). Typical function-based prompts include:

- ◆ Increase Productivity
- ◆ Encourage Carpools
- ◆ Increase Capacity
- ◆ Accommodate Mass Transit
- ◆ House People

Typical fact-based prompts include:

- ◆ Mechanical
- ◆ Electrical
- ◆ Project Management
- ◆ Excavation
- ◆ Structures

The total number of ideas increased when the brainstorming prompts were changed from functions to facts. For the eight studies about 33% of the ideas came from fact-based creativity; the function-based creativity yielded 67% of the ideas.

It is easy to see that the function-based prompts are different—at a higher level of abstraction—than the fact-based prompts. It is less clear why shifting paradigms expands creativity by 50%.

ANALYSIS OF RESULTS

Why do VM teams produce more ideas using both types of prompts (function- and fact-based) than with only one type? In the eight example studies the function-based prompts were used first and the fact-based prompts followed to supplement the creative

session. It was apparent that the team members were able to relate to both types of prompts; that is, many ideas were elicited in both parts of the brainstorming session. However, it was also apparent (on reflection) that certain ideas were “connected” to the functions and others are “connected” to the facts of the study projects in the minds of the team members.

When team members are untrained or inexperienced in VM they may be at a disadvantage when the team leader applies function analysis and expects everyone on the team to respond fully with ideas in the function paradigm. This was clearly demonstrated when the fact-based prompts were used and a whole new stream of ideas came forth. It was like the team was “coming out of the cold to the warmth of the familiar.”³ This flood of new ideas occurred because the team members had entered the study with their fact paradigm well entrenched in their thinking; any pre-study of the project documents was filtered by their discipline paradigm. Thus, when the prompts based on project functions run their course the prompts based on project facts effectively restarted the creativity session.

Rather than the fact-based ideas being inferior—just the leftovers--the quality of the second set of ideas (fact-based) remained high compared to the first (function-based) ideas. The percentage of “Hi-Rank” ideas (ranked 6 to 10 on a scale of 1 to 10) in the example projects was 54% for the function-based ideas and 46% for the fact-based ideas. The expectation that the second set of ideas ought to be completely inferior to the first set was not supported by these data. While there were fewer high-ranked ideas there were still a significant number of “new” ideas the VM team could develop into alternatives. While about 62% of the developed alternatives were function-based, a large number, 38%, came from fact-based ideas.

A closer look at these data revealed that there are really two distinct sets of information. Five of the studies used an average of six function prompts for creativity with another eight fact prompts. The remaining three studies also had six function prompts but only one fact prompt. In those three studies the final prompts used to elicit more ideas was “project management”. When the results from these studies are separated from the other five (as they are in Table 1) there is a noticeable difference.

The use of multiple fact prompts in the five studies resulted in 42% of the total ideas, 51% of the Hi-Rank ideas and 50% of the developed alternatives (compared to 17%, 29% and 6% for the single fact

prompt studies). Thus, as shown in Figures 1 and 2 there is a distinct advantage in using multiple fact prompts—even though in all eight studies more ideas and more alternatives resulted. One reason for this is that there may need to be a familiar fact prompt for all disciplines on the team to draw out certain team members. (Another method for increasing creative ideas involves combining group and individual brainstorming⁴; both methods can be used concurrently.)

PARADIGM THEORY AND PRACTICE

The dictionary defines paradigm as “any example or model”; the thesaurus adds “pattern, standard, filter and map”. Plsek further explains that a paradigm “is simply the accepted belief of the day”⁵. VM team members as well as team leaders all have their accepted belief system. Each approaches a VM study with their personal map or filter through which they view the study project.

Covey says that “quantum leaps in performance and revolutionary advances in technology require new maps, new paradigms, new ways of thinking about and seeing the world”⁶. The use of function analysis is one tool used to help team members see through a new filter of functions. The function analysis phase of the VM job plan is designed to change paradigms—to open minds to new creative solutions.

Team members who participate in function analysis and help construct a FAST diagram may be unfamiliar with the technique. When the team leader asks the team to temporarily abandon their factual paradigm in favor of the VM functional paradigm they may quietly withdraw from the creative work of the team. While they may respond with some understanding to the new function descriptions they may be uncomfortable with this paradigm-changing procedure. For a short time they can verbalize ideas that answer the question: “How else can we satisfy this function?” But does function analysis unleash all possible ideas?

Shifting back from the paradigm of function-based brainstorming to a fact-based one allows the team members to return once again to their familiar paradigm. The mechanical engineer can verbalize ideas about the details of the mechanical systems in a building; the structural engineer can do the same for a bridge design. More ideas are elicited because a paradigm shift has occurred within the VM study process. Using fact-based prompts does not invalidate the use of function-based prompts; it

merely reveals that the team members came prepared to offer alternatives from their established paradigms and were first asked to think functionally. Both techniques generate useful alternatives; both should be used to give the team members a larger number of “targets” to “throw” their ideas against.

CONCLUSIONS

These results suggest that using only function-based prompts for VM creativity sessions may be self limiting. They also indicate that using two paradigms—function-based and fact-based brainstorming—can expand creativity. While function analysis is important for stimulating “out of the box” ideas it is equally important to speak the language of the VM team members and use their factual basis for seeking alternatives. Fewer high-ranked fact-based ideas may emerge; however, any additional ideas that provide new avenues for exploring alternatives to the original concept are welcome. This method may seem contrary to the VM philosophy that functions are the “correct” way to prompts creative sessions. Actually, it only recognizes the two sets of ideas waiting to be tapped in the minds of the team. Both function- and fact-based idea generation can be used to expand creativity in VM studies.

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Table 1
Number of Ideas and Alternatives by Creativity Type

Study Topic	Create by Function				Create by Fact				Combined Totals		
	Total Functions	All Ideas	Hi-Rank Ideas	Developed Alternatives	Total Facts	All Ideas	Hi-Rank Ideas	Developed Alternatives	Total Ideas	Hi-Rank Ideas	Total Alternatives
1 Federal Computer Facility	5	81	32	6	6	109	79	40	190	111	46
2 City Water Mains	6	79	33	11	4	83	36	6	162	69	17
3 Interim Freeway Widening	11	160	45	11	10	42	20	8	202	65	19
4 Freeway Widening & Interchange	4	98	43	15	13	95	47	5	193	90	20
5 New High Occupancy Lane	5	102	37	15	5	44	20	2	146	57	17
5 Studies	Average Percent	6	104	38	12	8	75	40	179	78	24
			58%	49%	50%		42%	51%			50%
6 Water Treatment Plant	8	122	13	10	1	34	16	0	156	29	10
7 Water Supply Intertie	5	180	64	25	1	27	13	2	207	77	27
8 New Freeway Interchange	4	96	19	11	1	19	11	1	115	30	12
3 Studies	Average Percent	6	133	32	15	1	27	13	159	45	16
			83%	71%	94%		17%	29%			6%
8 Studies	Total Percent		918	286	104		453	242	64		
			67%	54%	62%		33%	46%	38%		

Figure 1
Create by: 6 Functions + 8 Facts

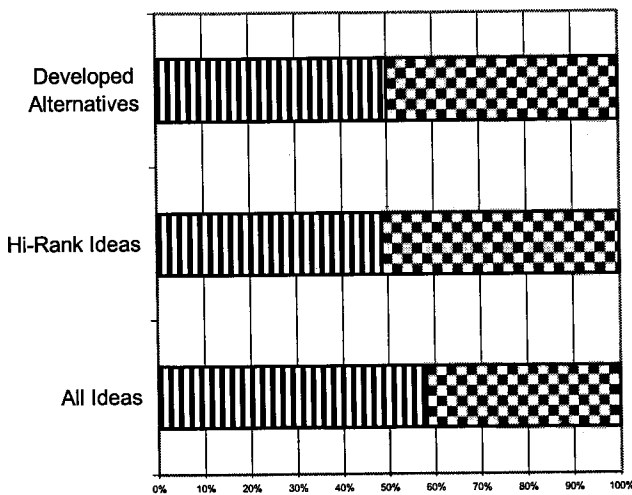


Figure 2
Create by: 6 Functions + 1 Fact

