

ENHANCING CREATIVITY WITH PENCIL AND PAPER

Roger B Sperling, CVS



Roger Sperling, Vice President of Value Management Strategies, has devoted the past eleven years to the practice of value management. During his 40-year career in engineering and project management, he established the Plant Engineering VM Program at Lawrence Livermore National Laboratory. Mr. Sperling has led 100 VM studies on transit and transportation facilities, research laboratories, military installations, federal buildings, water and wastewater plants, and engineering design procedures. He has taught VM workshops in Europe and North America and is the author of many articles on value topics. He is currently serving SAVE International as Vice President, Marketing and Editor in Chief of *Value World*.

ABSTRACT

Using individual, written brainstorming augments the group, verbal brainstorming session used in value methodology (VM) studies. Records from nine team studies document consistent yields of new, high-ranked ideas for individual idea creation that followed seemingly exhausted group brainstorming sessions. The theories of creativity as applied to idea generation lead to an understanding these results.

INTRODUCTION

The creative phase of VM studies most often takes the form of a brainstorming session, "a chain reaction of ideas ignited and then sustained".¹ Typically these are facilitated group sessions, allowing the VM team to verbalize ideas that are recorded for later evaluation. The productivity of this process was enhanced in a series of nine transportation studies, by changing to an individual mode of idea generation after completing the group mode. Having team members silently write ideas with pencil and paper that were then shared in a round robin session not only added to the number of raw ideas but brought out a number of new, high-ranked ideas. Consistent application of the supplementary pencil and paper creative session has shown tangible benefits, suggesting that more than one type of idea generation can be useful in VM studies.

CREATIVE PHASE

The creation of ideas in a VM study is a key activity of the team-centered process. The initial phases of the VM Job Plan (Information, Function Analysis) are designed to prepare for the creative session; those that follow (Evaluation, Development, Presentation) expand the ideas into viable alternatives for improving value. There are four critical aspects of the Creative Phase:

- ◆ **Function Based.** Function analysis opens the doors of creativity in the search for new ideas. Using functions (verb-noun descriptors) to define the problem, rather than items, leads the VM team to a higher level of abstraction and stimulates a wider range of alternatives.
- ◆ **Deferred Evaluation.** The dictionary definition of "brainstorm" is two-fold: a spontaneous clever idea; and, a foolish idea. Honoring every idea, whether clever or foolish, by suspending judgement during the creative session assures that none are prematurely rejected. Concentrating on generating a large quantity of ideas without regard for their intrinsic quality is crucial for stimulating team creativity.
- ◆ **Trust in Process.** Both the team leader and the team must trust in the process. They must have confidence that, when the VM team performs the brainstorming ritual of receiving all ideas equally, it will be worth the effort, and that this

“emergent thinking...is the key to breakthrough in thought.”²

- ◆ Safe Environment. Creating within the VM team “an environment for open thought [that allows] psychological safety and freedom”³ permits the expression of ideas without concern for embarrassment and allows “the stimulation of one person’s mind by another’s”.⁴

There are many idea generation techniques; however, group brainstorming is almost universally used because it is simple to facilitate.⁵ In functional terms, the higher order function of the brainstorming session is to “Generate Wide Variety of Ideas”; the basic functions are to “Encourage Free Flow of Ideas” and “Generate Unusual Ideas”.⁶ Inconsistent results and criticism of the brainstorming method, that “it is a tool for constructive group discussion rather than a tool for creative idea generation”,¹⁶ calls for a re-examination of ways to improve this VM practice.

The use of individual brainstorming (also called Nominal Group Technique, or silent brainstorming) is explored here as a viable way of expanding on the quantity and quality of creative ideas. It is a way to motivate the team to achieve an “extended effort [that] involves generating additional possible solutions to a problem after the initial ‘top of the head’ or previously considered ideas have been offered”.⁷

INDIVIDUAL vs. GROUP BRAINSTORMING

Brainstorming was originally intended “to improve the effectiveness of business meetings...to promote fluency [many ideas] and flexibility [different ideas] in groups”. Only as an afterthought did it become linked to creativity.⁸ In random brainstorming, typical of VM studies, the team leader asks for alternatives to satisfy the functions and records the ideas as rapidly as possible to maintain a flow of thought. When used effectively the team is energized into a stream of group consciousness.

But often not all team members participate equally in this type of creative session. Occasionally one or two members may even remain silent for the entire activity. There are two observed causes for reluctance to verbalize ideas:

- ◆ Differences in professional discipline can inhibit interaction, especially if there are team members who feel they are out of place. A non-technical person can be uncomfortable among a group of technically-trained team members and refuse to

share ideas seen as irrelevant to the search for creative alternatives.

- ◆ Cultural differences in team members can affect the creative process. Individuals from non-Western backgrounds may be uncomfortable sharing non-conforming ideas within a group of peers, while others seem perfectly comfortable with the process.

Recognition of these individual differences in VM team members prompted the initial use of individual brainstorming as a supplement to the group effort.

USING PENCIL AND PAPER

During a recent transportation VM study the creative session had reached its apparent end when no one offered a new idea. Rather than stop the creative session the team leader asked the team members to “take a pencil and piece of paper and write five new ideas”. They were given a 10-minute time limit. When time expired each person, including the team leader, was asked to share aloud one of their ideas which was recorded with those from the previous group brainstorming session. A round robin of sharing these new ideas continued until all members had exhausted their lists. Only new ideas were recorded.

The initial response to the request to write down more ideas was a mixture of surprise and concern—expressed in moans and groans—because most thought that there were no more ideas to be found. The surprising result was that there were a significant number of new ideas added to the original list. Further, the new, individual ideas were of comparable quality, as revealed in the later evaluation phase when the team ranked each idea.

STUDY PARAMETERS

After the positive results of the first use of individual brainstorming it was used on eight subsequent transportation studies with equal success. Table 1 summarizes the nine studies that were conducted over a 17-month period on a variety of highway projects including road widening, interchange upgrades, bridge approaches and high-occupancy vehicle lanes. The project costs ranged from \$33,000,000 to \$293,000,000.

The nine VM studies were of different duration, from four to seven days, with an average of five days (see Table 2). The VM teams employed both agency

and consultant members; the “average” VM team had the following characteristics:

- ◆ 6 agency team members
- ◆ 3 consultant team members (including VM team leader)
- ◆ 9 members total

There were two dozen outside consultant team members who served on the nine teams; only four participated on more than one study, so the nine teams were essentially unique groups, except they had the same team leader.

QUANTITY OF IDEAS

Results from a series of nine VM studies, using the identical process of following group brainstorming with individual brainstorming, are tabulated in Table 2. The total number of All Ideas for each study (147 average), as well as the number of functions that formed the basis for the brainstorming (9 average), are shown. (All Ideas means every idea on the evaluation scale of 1 to 10.) The ideas are broken down into Group and Individual numbers as well as percentages.

The tabulation for All Ideas shows that the average percentage increase in new ideas was 26%, with a range from 17% to 33%. That is, the individual brainstorming consistently yielded more ideas, which amount to 26% of the total recorded, or approximately one out of four. Included in these additional ideas are the ones written on paper by individual team members as well as some few follow-on ideas that were added to the lists by team members in the latter phases of the study. The VM teams were surprised by this result. But the relative quality of the individual ideas was even more surprising.

QUALITY OF IDEAS

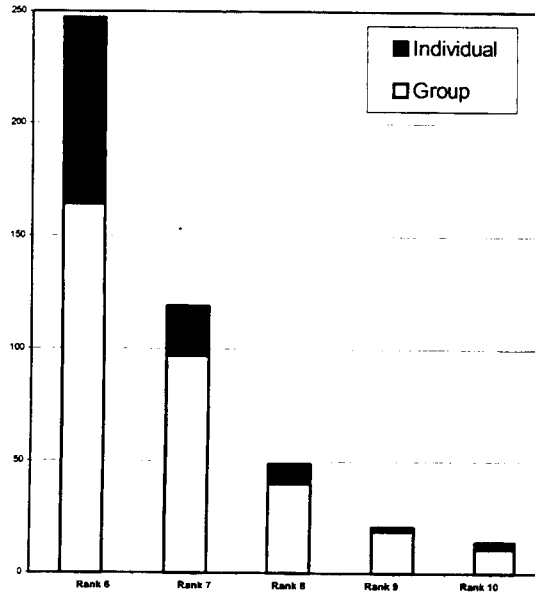
After the ideas were evaluated the quality of the individual ideas was compared to the group ideas. Table 2 shows the distribution of all High-Ranked Ideas for the nine studies. These ideas had been ranked 6 to 10, with 10 being the most promising, followed by ranks 9,8, & 7; ideas ranked 6 were selected for partial development as design suggestions. Ideas combined with previous High-Ranked Ideas during evaluation were not included in the totals.

The number and percentages of High-Ranked Ideas show comparable results with the Individual Ideas tracking the Group Ideas. The average High-

Ranked Ideas for the Group category was 34% and the average for Individual Ideas was 37%. This means that the quality of the individual, written ideas was essentially the same as those verbalized by the group.

The evaluated ideas demonstrate the value of using multiple modes of creativity in VM studies. As shown in Table 3 and illustrated in Figure 1, the High-Ranked individual ideas for these studies were distributed over the full range of ranking, from Rank 6 through Rank 10. That is, for the nine studies in aggregate, the extended effort yielded ideas with strong potential for improving the study project. Again the VM teams expressed delight in not only finding more ideas, but high quality ideas, using the individual brainstorming technique.

Figure 1
GROUP AND INDIVIDUAL IDEAS BY RANK
FOR NINE TRANSPORTATION VALUE STUDIES



CREATIVE THEORY

There are a host of theories of the creative capacities of humans (see References for a limited bibliography). But what theory can explain why individual brainstorming can add to the group brainstorming activity in a positive way? Five clusters of theories are summarized below:

- ◆ Thinking Style. Humans have a variety of styles of thinking. Among them is the *Synthesis* (only 11% of the population) who “finds it enjoyable to entertain entirely opposed ideas while waiting for a resolution to ‘come’ intuitively.”⁹

Switching from group to individual brainstorming may simply be a way for those team members with different styles of thinking (such as the 35% of people called *Analysts*) to participate in a more comfortable way.

- ◆ Hand Involvement. People develop mental blocks that cause them to become bogged down when solving problems. One technique to stimulate the brain is to start writing with the non-dominant hand; “the unfamiliar muscular movements...trigger electrical flow in the non-dominant side of [the] brain” to yield a new idea.¹⁰ Further, the ideas that there is a “central role of the hand in human thought, long before the advent of language”¹¹ and, that “the hand speaks to the brain as surely as the brain speaks to the hand”¹² suggest vital hand-brain connections.

Changing from speaking ideas to writing ideas, no matter what hand is used, may be the stimulus to draw out new, valuable thoughts.

- ◆ Outside Stimulus. Ambiguity can be a stimulus to the imagination. Facilitators use random data to stimulate creative thinking, such as selecting a word on a page of text as a springboard for new ideas. This is expressed as “let a random piece of information stimulate your thinking”.¹³

Closing down the group brainstorming session to write individual ideas may cause team members to look about the room for written words or physical objects to mentally trigger new ideas, that then emerge in writing.

- ◆ Brain Switching. Culture determines individual responses to group situations. “Western society has favored the left-brained, rational approach”...while Eastern society uses a mode of thinking that is “distinctly right-brained...stressing feeling over thought”.¹⁴ VM capitalizes on the two-brain concept; it is a powerful tool because it “is a balanced application of both the left and right brain activity.”¹⁵

Switching from verbal to written idea generation may unlock the intuition arising in the right side of the brain—“which cannot speak” for itself¹⁴—by letting the left side do the writing for it.

- ◆ Extending Process. Movement, keeping the team process moving forward, is a key underlying principle of creativity, to “keep exploring and connecting our thoughts [so] the mind—which is never idle—generates new connections and ideas.”¹⁶ Research has shown that more ideas can mean more good ideas: “quantity also breeds quality”.¹⁷ To motivate a team to continue creating ideas requires an intrinsic motivation (for fun) so they can enjoy the problem; conversely an extrinsic motivation (for reward) sets a false goal and sacrifices creativity.⁷

Extending the creative session by writing ideas after speaking ideas, if managed with sensitivity and humor, may profitably expand the expression of new ideas.

Which concept accounts for continued creativity with individual brainstorming following group brainstorming? Perhaps all of them. For the heterogeneous VM team, with a diversity of persons, is a complex, dynamic, synergistic system that cannot—and should not—be explained in overly simple terms. However it occurs, individual brainstorming, when used in conjunction with group brainstorming, is an easy technique to increase VM team creativity.

SUMMARY

The use of individual, pencil-and-paper creativity as a supplement to group brainstorming has been documented for nine transportation VM studies. The VM team can stretch its creative work beyond the usual group session, not only increasing the number of raw ideas but also adding to the better ideas deserving development into VM alternatives. Creativity theories suggest the mechanisms within the individual mind—and the group mind—of this enhanced creativity and support the use of more than one method of idea generation in VM studies. While results vary from study to study, when this two-phase brainstorming process is followed it generates more useful ideas, enhancing the power of the VM process.

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TABLE 1

PROJECTS AND TEAMS FOR NINE TRANSPORTATION VALUE STUDIES

Study Number	PROJECT DATA			TEAM MEMBERS		
	Study Date	Type	Cost	Agency	Consultant	Total
1	Jun-97	Road Widening	\$293,000,000	6	2	8
2	Sep-97	HOV Lanes	\$126,000,000	9	3	13
3	Nov-97	Widen/Interchanges	\$94,000,000	5	2	7
4	Mar-98	Interchange	\$68,000,000	7	3	10
5	Apr-98	Widen/Interchanges	\$57,000,000	6	2	8
6	Jun-98	Widen/Interchanges	\$266,000,000	5	5	10
7	Jun-98	Bridge Approaches	\$128,000,000	7	5	12
8	Sep-98	HOV Lanes	\$52,000,000	4	3	7
9	Oct-98	Interchange	\$33,000,000	4	3	7
		Average	\$124,000,000	6	3	9

TABLE 2

GROUP AND INDIVIDUAL CREATIVE IDEAS FOR NINE TRANSPORTATION VALUE STUDIES

				ALL IDEAS (1-10 Rank)				HIGH-RANKED IDEAS (6-10 Rank)			
				Group		Individual		Group		Individual	
Study No.	Study Days	Number of Functions	Total Ideas	No. of Ideas	% of Total Ideas	No. of Ideas	% of Total Ideas	No. of Ideas	% of Group	No. of Ideas	% of Individual
1	5	4	111	86	77%	25	23%	30	35%	11	44%
2	6	20	202	158	78%	44	22%	51	32%	17	39%
3	5	11	149	105	70%	44	30%	37	35%	16	36%
4	5	3	148	100	68%	48	32%	26	26%	16	33%
5	4	5	101	68	67%	33	33%	30	44%	14	42%
6	7	9	234	194	83%	40	17%	60	31%	13	33%
7	5	10	130	89	68%	41	32%	27	30%	12	29%
8	5	13	141	115	82%	26	18%	45	39%	9	35%
9	5	6	109	84	77%	25	23%	25	30%	11	44%
Average	5	9	147	111	74%	36	26%	37	34%	13	37%

TABLE 3

DISTRIBUTION OF HIGH-RANKED IDEAS FOR NINE TRANSPORTATION VALUE STUDIES

Study Number	Idea Source	High-Ranked Total Ideas	Rank 6	Rank 7	Rank 8	Rank 9	Rank 10
1	Group	30	18	6	3	2	1
	Individual	11	8	1	1	1	0
2	Group	51	28	14	7	2	0
	Individual	17	13	3	1	0	0
3	Group	37	13	16	6	2	0
	Individual	16	14	1	1	0	0
4	Group	26	11	9	2	2	2
	Individual	16	7	4	3	1	1
5	Group	30	16	13	1	0	0
	Individual	14	10	3	0	0	1
6	Group	60	28	9	9	9	5
	Individual	13	11	0	2	0	0
7	Group	27	16	6	3	2	0
	Individual	12	7	4	1	0	0
8	Group	45	24	17	4	0	0
	Individual	9	7	2	0	0	0
9	Group	25	10	7	5	0	3
	Individual	11	6	4	0	0	1
Total	Group	331	164	97	40	19	11
	Individual	119	83	22	9	2	3