Virtual VE – Evolving the Value Workshop

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Abstract
Value Engineering (VE), the analysis of function, quality, and cost, has traditionally been applied as an in-person workshop with the design team providing a short project in-brief and the independent VE team secluded for several days to independently analyze the project and identify opportunities to improve a project's value. The advent of the global health crisis curtailed the ability of VE teams to meet in-person for a workshop over an extended period (2+ years). This necessitated a migration to on-line virtual workshops as the primary delivery vehicle and the corresponding unexpected opportunity to experiment with different delivery approaches.

This paper is the fourth in a series that describes the factors that contribute to a successful virtual workshop. The author presents recent study data and describes how the Virtual Model combined with the concept of the Integrated VE Team can exceed the performance of the Traditional VE Workshop and take the Value Methodology to the next level.

The Traditional VE Approach
The Traditional VE workshop has been successfully applied in Product, Project, and Process applications and exhibits the following characteristics:

- In-Person Workshop
- Independent VE Team (4-8 SMEs)
- PDT project In-brief (1.5 hr)
- VE Team secluded
- Present Output to Owner/Designer
- Substantial Value Improvement

Study Type	Average ROI
On-Site Independent Team	17/1
On-site Integrated Team	26/1
Virtual Independent Team	29/1
Virtual Integrated Team	56/1

Table 1 – Performance Summary

This formal approach is most often focused on modifying the design to have a larger impact, improving the project's value either by impacting the cost (cost avoidance/increase) or a change in function or performance. It is focused on design, as the design effort typically represents 10% of project cost and controls the other 90%.

What if we offered a Better Workshop?
The advent of the global health crisis curtailed the ability of VE teams to meet in-person for a workshop over an extended period. This necessitated a migration to on-line virtual workshops as the primary

delivery vehicle and the corresponding unexpected opportunity to experiment with different delivery approaches.
While there certainly were struggles to replicate the success of the Traditional (in-person) workshop with many failures that did not deliver the expected results, there were also successes that validate the virtual workshop as a successful delivery model. We need to seize this opportunity to reinvent the VE workshop and improve the use of talent to create a new virtual workshop model focused on:

- Collaboration
- Capabilities
- Job Tasks

Challenge:
How do we reconstruct the Value Workshop process to optimize the opportunities presented by the virtual format and better utilize the resources involved?

The Virtual Model

At its core, the VM methodology is a communication vehicle. The objective of the workshop is to bring together the right group of smart people, promote in-depth real discussions of the project, and identify creative solutions to improve the project's value to the owner. If viewed with this perspective, a framework for the successful virtual workshop can be developed that capitalizes on the strengths of the virtual format.

Collaboration

The ease of running a virtual meeting and the convenience for the participants to attend results in much greater participation than is typical in a traditional in-person workshop. The virtual format brings the ability to collaborate with large groups to the workshop. Now we can have a large group of Stakeholders (Project Managers, SMEs, Users), the Design Team, and the VE Team all participate fully – we call this the *Integrated VE Team*. It is typical to have 15 to 30 participants in a virtual workshop providing a valuable exercise for the Design Team to hear the questions, positive comments, and concerns that flow from these discussions. It also can be an opportunity for the Design Team to surface areas that are not well developed as a component of the VE workshop.

The Collaborative portion of the workshop should:

- Facilitate communication
- Increase understanding by all participants
- Force discussion of complex issues
- Increase the number of available viewpoints
- Force the questioning of why things are done this way
- Help participants to bond and become a team
- Deliver results valued by the owner

It is the questioning process that engages the *Thinking Mind* (Kahneman, 2011) and drives group participation. It is a necessary component for the creative thinking process that is described as *Lateral Thinking* (de Bono, 1970).
What is necessary to successfully implement the Virtual Model is a common understanding by all participants that we are all on the same team (the VE team) with the common goal of making the project a better value for the owner.

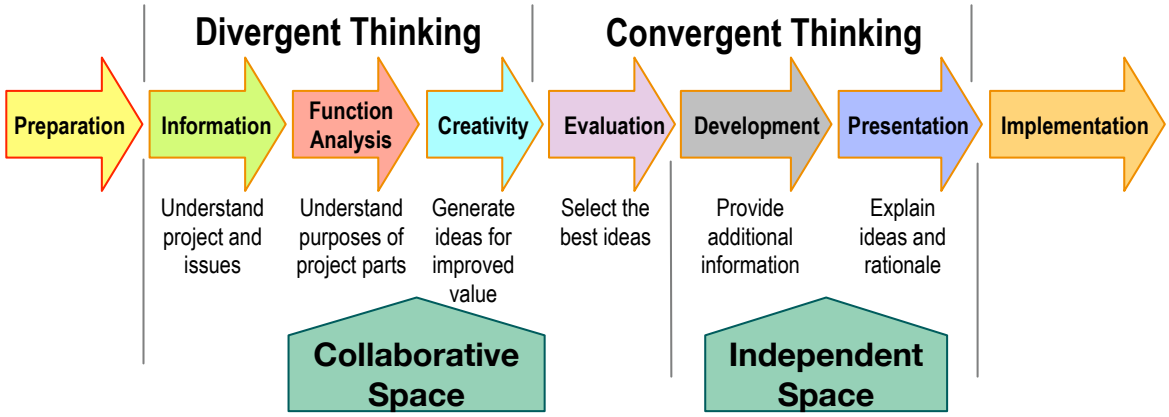
Collaboration as a Differentiator

During the 1960s, a new awareness of the value of innovation to the future survival of the organization developed. To identify these best practices, researcher Arthur Koestler interviewed major companies of the period to identify the process that drove innovation in large organizations. In his book *(The Act of Creation)* (Koestler, 1964) he identified what he termed the optimal creative problem-solving model that was common to these successful organizations. It consists of three components:

- *Gather great minds*
  - Smart people with the experience and understanding to solve the problem
- *Load the mind*
  - Understand all aspects of the problem completely before proposing solutions
- *Create a receptive environment*
  - Expect a better solution and give enough time and resources to succeed
  - Accept failure as the process of learning what works

This approach has been validated time and again through highly creative small groups of experienced professionals that come together to focus on specific problems and generate innovative solutions – the collaborative model.

The traditional face-to-face workshop would involve a limited number of participants from appropriate disciplines with the corresponding limit to available perspectives. The time pressure to finish led to a limited analysis of alternatives. The virtual workshop allows for a larger group involvement – the *Integrated Team* – which brings new information to better understand requirements and constraints. It also provides better use of participants time which is critical to securing participation in the collaborative portion of the virtual workshop. And group collaboration results in better ideas.



The Integrated Team

The Integrated Team model brings the Design Team into the process, with information about requirements, other design approaches not pursued, and other potentially desirable solutions not included in the current design.

The tensions typical between the design team and the VE team dissipate as the group works together as respected professionals to improve the project. The virtual format, with participants communicating singularly via an internet connection, changes the group dynamics normally present in the face-to-face format. It reduces the barriers inherent in specific group identities and treats everyone as belonging to

the same team, the VE team. We call this the *Integrated VE Team*. The design team and Stakeholders are encouraged to participate right through the Evaluation Phase.

The successful Integrated Team Model separates the phases of the Job Plan into activities that can be accomplished effectively with the Integrated Team from the things that are best done by the VE Team only.

Integrated Team (On-line or On-site)

- Information Phase
- Function Analysis Phase
- Creative Phase
- Evaluation Phase
- Presentation Phase (On-line meeting)

VE Team (Off-line/in-office)

- Development Phase
- Presentation Phase (Report development)

The ability to include a larger group in the process increases the amount of discussion and the corresponding total knowledge available to the team. Including the Stakeholders in the discussions brings the owner/customer into the ideation process, reinforcing a focus on Stakeholder requirements while providing the ability to re-clarify needs and desires, and communicate any change in priorities. It helps both the VE team and the Design team understand the strengths and weaknesses of the current design from the Owner's perspective. It is this communication that stimulates the *Thinking Mind* (Kahneman, 2011) to search for better solutions for the Creative Phase. Additionally, during the Evaluation Phase, Stakeholders provide real-time confirmation that individual ideas are worth pursuing. The large Integrated Team also leads to much higher acceptance of the final proposals that the VE team presents in the study report, as both the Design Team and the Stakeholders have participated in their development and have ownership in the recommendations. The process develops the participants into a High-Performance Team that can accomplish powerful collaboration providing the following benefits:

- Improved Cross-Functional Communication
- Questioning Process (Debate)
- Professional Bonds Strengthened by Respectful Discussions
- Release Inherent Creativity
- Create New & Better Designs

Another observed outcome is the greater number of qualitative (cost increase) proposals that come from the expanded Team. We observe that the Integrated Team has a broader focus on improving the value of the project from the Stakeholders' perspective and is consequentially more open to proposals that increase value at a potential increase in project cost compared to the traditional Independent VE Team with their focus on increasing value by reducing cost. The resulting Qualitative Proposal Summaries while not necessarily included in the current design, can be held at the ready as fully developed Proposal Summaries to become Bid Options should the Owner have a source of funding available at the time of project letting, providing the Owner real options to improve the value of the project.

Virtual Workshops

We must recognize the value of face-to-face workshops in situations where the need to develop personal relationships and improve project coordination and professional cooperation are important components. The virtual meeting cannot replace the benefits of human Interaction and the information garnered from an on-site visit. Some workshops are simply better face-to-face:

- 35% Design Review
- Product Development
- A need to view the problem

- Complex Environmental Issues

Our experience validates that virtual meetings for VE are an efficient solution and have superior results in most situations. **We believe that 90% of VE workshops can be virtual**.
What is required are effective virtual workshops. We can't simply replicate the traditional workshop and get superior results; we need to redesign the workshop to utilize the advantages gained through the virtual format. The most successful VE workshops we run are great communication vehicles with a large Integrated Team (VE Team/Design Team/Stakeholders) in either the Virtual or the On-site format.

Effective Virtual Collaboration

A key component of this VM collaborative process is the focus on driving participant engagement with the resulting sense of ownership over one's work, both individually and as a member of the VE team. From this sense of ownership is derived the group accountability for the results of the new design effort, a shared understanding that we as individuals own the ideas and are responsible for the success of the new design. This is a critical difference of the collaborative *Integrated Team* approach that substantially increases the impact of a VE workshop as compared with the more traditional *Independent Team* approach to project VE.

An effective Virtual Environment has the following characteristics:

- Well-Planned Process (No Dead Time)
- Structured Communication Activities
- Promote Discussion & Questioning (Debate)

A successful workshop requires a tightly planned agenda along with specific planned activities that support the on-line (collaborative) portion of the workshop. The facilitator needs to keep the discussion moving and interesting or risk losing participation. We have found it important to utilize a co-facilitator to handle the requirements of on-line, real-time documentation while the lead facilitator manages the process.

A critical objective is to better utilize the participant's time during the workshop:

- The Integrated Team during the Collaborative Space
- The VE Team during the Independent Space

We also find great success in utilizing the key participants to make pre-assigned presentations, sending out these requests before the workshop. These documents are designed to drive VE team communication about the project and promote the questioning that engages the Thinking Mind. (Kahneman, 2011).

VE and Innovation

We have all experienced being immersed in a difficult problem, surrounded by reams of information with no solution in sight, only to have a solution emerge when we are off pursuing an unrelated activity. Innovation takes time; time to understand the problem, time to discuss the issues, time to challenge existing solutions, time for the thinking mind to process the information and time to develop a new solution.

Generating ideas, (the *Divergent Thinking* process) (de Bono, 1970) to improve the project value for the owner is the reason we do Value Engineering workshops. As such, it behooves us to review the recent literature to understand the current thinking on the creative process that we can incorporate into a reconstructed virtual workshop.

How do we improve the output of the Creative Phase?

The brainstorming process has been studied by academics since its inception in 1948 by Alex Osborne with his book *Your Creative Power,* with many studies reporting that the results of group brainstorming are inferior to individual idea generation (Osborne, 1948).
From chapter 33 of his book: *How to Organize a Squad to create Ideas*

- *"When a group works together the members should engage in a "brainstorm" which means "using the brain to storm a creative problem – and doing so in commando fashion, with each stormer attacking the same objective"*
- Rule #1: No criticism or negative feedback. Osborn believed that If people were worried that their ideas might be ridiculed by the group, the process would fail
- Rule #2: Encourage the most "freewheeling" associations to generate a large quantity of ideas

Brainstorming became the most widely used creativity technique in the world. The underlying assumption of brainstorming is that if people fear saying the wrong thing, they'll end up saying nothing at all.

Extensive research shows that it doesn't work.

In a study at Yale University (1958):

- Forty-eight male undergraduates were divided into twelve groups and given a series of creative puzzles. The groups were instructed to follow Osborn's guidelines
- As a control sample, the scientists gave the same puzzles to forty-eight students working by themselves
- The solo students came up with roughly twice as many solutions as the brainstorming groups, and a panel of judges deemed their solutions more "feasible" and "effective"

Sheena Iyengar, a Professor at Columbia Business School, has assembled both the academic research on idea generation and her own research over a decade and concludes that traditional group Brainstorming is usually a waste of time. (Iyengar, 2023)

Keith Sawyer, a psychologist at Washington University, has summarized the science: "Decades of research have consistently shown that **brainstorming groups think of far fewer ideas than the same number of people who work alone and later pool their ideas.**" (Sawyer, 2017)

Osborn was right about this: human creativity has increasingly become a group process. "Many of us can work much better creatively when teamed up," he wrote, especially with the complex problems in science. Collaboration does work. (Lehrer, 2012)

What then, is the best method to stimulate creativity in VE?

Charlan Nemeth, a professor of psychology at the University of California at Berkeley has studied this extensively (Nemeth, 2018)):

- Divided two hundred and sixty-five female undergraduates into teams of five
- Twenty minutes to come up with as many good solutions as possible
- Gave all the teams the same problem
  - "How can traffic congestion be reduced in the San Francisco Bay Area?"
- Assigned each team one of three conditions:
  - Group1: Standard brainstorming ground rules: including the no-criticism rule
  - Group 2: "Debate" condition: You should debate and even criticize each other's ideas
  - Group 3-5: No further instructions, free to collaborate however they wanted

The brainstorming groups slightly outperformed the groups given no instructions, but teams given the debate condition were the most creative generating twenty per cent more ideas.

Nemeth: "While the instruction 'Do not criticize' is often cited as the most important instruction in brainstorming, this appears to be a counterproductive strategy. Our findings show that debate and criticism do not inhibit ideas but, rather, stimulate them relative to every other condition."

- Dissent stimulates new ideas because it encourages us to engage more fully with the work of others and to reassess our viewpoints

- "There's this Pollyannaish notion that the most important thing to do when working together is stay positive and get along, to not hurt anyone's feelings - Well, that's just wrong. Maybe debate is going to be less pleasant, but it will always be more productive. True creativity requires some trade-offs."

The Virtual VE Workshop Agenda

Our goal is to improve both the output and the experience of the Virtual workshop by re-focusing it as a collaborative effort that efficiently utilizes the time of the professionals involved.

We open the VE process and invite all to participate in the collaborative effort resulting in complete ownership of the process and the results by the full Integrated Team. We want to change the VE workshop experience from an often unpleasant requirement to a productive collaborative effort that all agree was time well spent. Further, the Individual Space component allows the VE Team members to work efficiently developing the VE Proposals from their workspace without being tied to a conference room or a requirement to be continuously on-line. Our goal is to increase the effectiveness of the workshop, not to force hours of interaction.

Without the constraints of the in-person workshop, the Virtual workshop can be separated into components to increase efficiency and better accommodate the schedule requirements of the participants. Deconstructing the traditional VE Workshop to develop a virtual model that incorporates these ideas gives us the following agenda:

Pre-Workshop

Pre-Workshop VE Review: 2-4 Weeks Prior

- 1-hr Organizational Meeting with Key Participants
- Workshop Agenda/Virtual VE Model/Expectations

Design Review: 1 Week Prior

- 1 ½-hr with Key Members of Integrated Team
- Design Team Leads/VE Team/Key Stakeholders
- Starts the Creative Phase

VE Workshop

Day 1 VE Study (5 hours) (Note: 5 hours on-line each day is the maximum time individuals can effectively contribute)
Day 1 of the Virtual VE Workshop is structured as a communication vehicle to present and discuss the project from multiple perspectives and bring all participants into the discussion. It is tightly structured with a continuously moving pace. The Stakeholder Value Perspective is prepared in advance and reviewed and updated with the group. The other Value Discussions are developed in real-time with the objective to drive discussion of the project and identify new areas of opportunity for value improvement, drawing the entire Integrated Team into the discussion. Effective collaboration requires that the participants are active in these discussions. These activities have been developed to encourage a high level of discussion.

Collaborative Space (Integrated Team)

Day 1 VE Study (6 hours)

Information Phase

- Value Engineering In-Briefing (CVS)
- PDT project discussion
- Review project economics
- Value Discussions
    - Stakeholder Value Perspective
    - Constraints/Needs/Desires
    - Risk review
    - Best Features of the Current Design
    - Features of Concern of the Current Design

Function Analysis Phase

- Random Function Analysis
- FAST diagram development (Task Diagram)

Collaborative Space (Integrated Team)

Day 2 VE Study (6 hours)

Function Analysis Phase

- FAST Diagram Team consensus
- Identify functional areas of focus

Creative Phase

- Group creativity
- Debate Condition

Evaluation Phase

- Review the creative ideas
    - Discussion of benefits (advantages/disadvantages) of each idea
    - Group consensus on ideas to pursue (Stakeholders Lead)

A note on the Creative Phase:

Per the previous discussion, the entire Integrated Team participates, with the Design Team Leads bringing their own ideas to add to the list. The Stakeholders often bring Qualitative Value Improvements (cost increases). We encourage in-depth discussion of each idea at the time it is offered so all can understand the issues. We find that the professional disciplines are highly respectful of other opinions and are interested in the opportunity to improve the project. This opening up of the Creative Phase greatly increases ownership of the resulting VE output. We are all on the VE Team.

A note on the Evaluation Phase:

Evaluation occurs as a group, with the Stakeholders having the greatest input as to which ideas are carried forward. The Design Team Leads contribute the development history to help the group understand why a particular idea will/will not work. Each idea is discussed fully and then a group consensus decision is reached with a simple Yes/No or IP (In Process) assigned. An effort is made by the facilitator to separate ideas that are not real VE items but are a component of the normal design development effort. The Ideas are assigned to the respective VE Team member for further development. Not having to write up Proposal Summaries is an important motivator for both the Design Team and the Stakeholders in that it allows them to participate in the enjoyable aspects of the Collaborative Space and be creative without having to do the heavy lifting.

Individual Space (VE Team)

Day 3/5 - *Development Phase*

- Independent Proposal Development by VE Team (in-office)
- Estimate Development

A note on the Development Phase:

The VE Team now works on detailing the ideas as Proposal Summaries within the efficiency of their own office. They need to be given enough time to develop quality write-ups, which we find to be about 3-5 days depending on the complexity and number of ideas, and another 2+ days to complete the independent estimates. This approach respects their desire as professionals to manage their own timeline and acknowledges that the high-skilled individuals we need on a VE Study have multiple on-going tasks to complete with demanding schedules.

Presentation Phase (All virtual)

- *Development Out-Brief Meeting (1.0 hr)* When the Integrated Team participates in the Collaborative Space they have a complete understanding of the ideas that will be developed into Proposal Summaries. What remains are the details of the proposals and the estimates. This meeting presents the completed Proposal Summaries to the Intergrated Team and kicks off the review process in preparation for the VE Consensus meeting.

- *Issue Draft Report*
- *VE Consensus Meeting (1.5 hr)*
- *Issue Final Report*
- *Close Our VE Study (1 hr)*

The Virtual VE Workshop – Function Analysis

During the Function Analysis phase, the team analyzes the project from a functional perspective, developing a visual function logic model (FAST diagram) to represent the relationships of the project. Each component of a project is defined by a functional description with allocated costs as the team works through the details of the project. This functional perspective redefines the project in an abstract manner intended to change the perspective of the team and connect with and challenge the thinking mind (create a receptive environment). Function Analysis is a Lateral Thinking Process that is well defined and repeatable.

When we teach our Function Analysis Workshops we focus on two approaches, what we present as the *Bottoms-Up* approach, which starts with identifying functions for individual components (as presented in the SAVE Function Analysis Handbook) and the *Tops-Down* approach, which starts with identifying the objectives of the project and then asks what else is important. We use the Bottoms-up approach for our Product studies where we can more easily identify individual components. We use the Tops-Down approach for Project studies when we have a large continuous design not easily separated into components. When in the virtual format we use the Tops-Down approach as it is conducive to group participation. We also use what we call the Task FAST diagram (as opposed to the Classical FAST diagram) as we have greater flexibility with the option for multiple Basic Functions to support the project approach. We start with Random Function Identification (RFI) and move into Visual Map construction (FAST diagram) transferring the functions identified in RFI to the Visual Map in real time with group direction. The objective is that all participate in the function development with particular emphasis on the Stakeholders and Design Team, so that the result fully describes the important aspects of the project, and consequently, the group owns the resulting diagram. The Facilitator is only the helper, asking questions and suggesting better word combinations that satisfy the simplified verb-noun definition, but if the team prefers a particular wording it must be acceptable. Driving for a perfect diagram with the Facilitator as the only one that understands the process will alienate the team. We send out all documents for review at the conclusion of Day 1 and start Day 2 with a document review. This exercise typically takes (2) experienced facilitators to manage the on-line process and eliminate dead time.

To be effective, the Function Analysis activity must be a real-time collaborative effort with the facilitators leading the team through function identification, function classification, and mapping them using the visual mapping framework (FAST diagram). This is the core component of the Divergent Thinking process. It is critical that the Value Team own the process and the resulting documentation. Identifying and mapping functions as a team can be done effectively in real-time with documentation that guides the team through the process.

What follows are the RFI and FAST documents from a recent workshop.

Function Analysis / Function Expansion		
How ⇨		⇦ **Why**
What must happen?	**What Is the most important?**	**What is the objective?**
		~~Support Mission~~
Inspect Vehicles Service Vehicles Maintain Vehicles Replace Components Repair Vehicles		Support Operational Readiness
Enclose Space Support Envelop Condition Space Conducive Environment Supply Water Remove Waste Life Safety Protect People/Assets Supply Current Distribute Current Illuminate Area Increase Mobility Develop Site Control Stormwater Facilitate Communication Protect Infrastructure Protect Environment Reduce Energy	Create Facility	Consolidate Services
Meet Budget Meet Schedule Create Facility Satisfy Needs Adhere to Standards Minimize Maintenance Expedite Design/Construction	Satisfy Stakeholders	

Table 2 – Random Function Identification

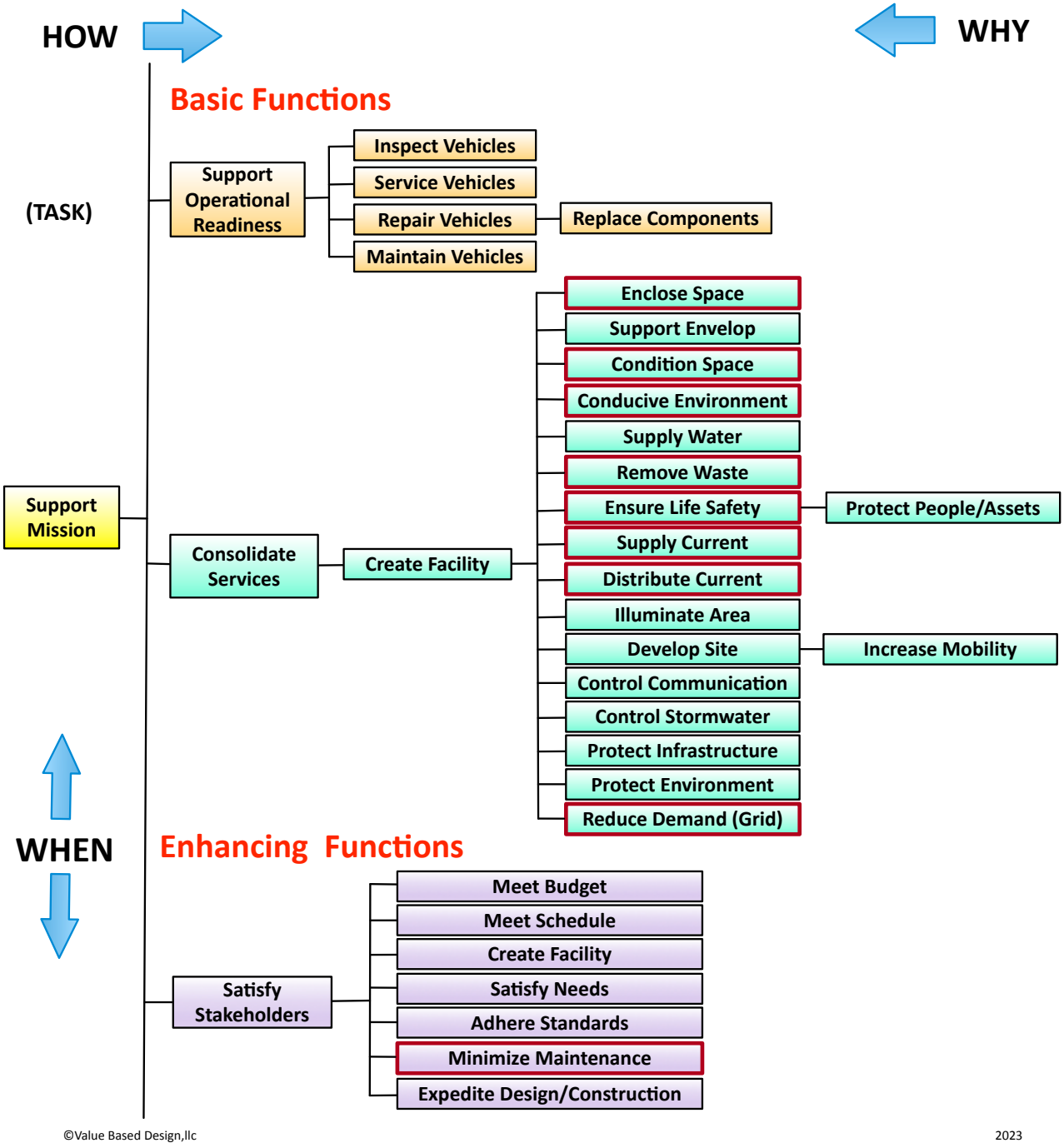


Figure 1 – FAST Visual Map

Virtual Workshop Length

The Traditional VE Approach with the team sequestered in a conference room did force a schedule deadline of 2-3 days for completed Development work, but we find greater acceptance with allowing the VE Team more control over their schedules. Experience teaches us that we must allow the 3-5-day period to complete the Proposal Summaries and a 2-day period to complete the independent estimates. The Out-brief meeting serves as a schedule milepost to drive document completion.
So, what is the workshop duration?

Most virtual workshops fall into the 2-day virtual Collaborative Space and the 3/5-day Independent Space timeframe depending on complexity. What was previously identified as a 24-hr/32-hr/40-hr workshop is now simply a VE workshop.

Integrated Team (14 hr total)

- Pre-Workshop effort (1.5 hr)
- VE Workshop (11 hr)
- VE Consensus Meeting (1.5 hr)

VE Team (30-40 hr total)

- Pre-Workshop effort (1.5 hr)
- VE Workshop (11 hr)
- Development Phase (16-26 hr)
- VE Consensus Meeting (1.5 hr)

The Integrated Team and Virtual VM: A Better Way

The following chart highlights the results we have obtained with the different VE primary delivery vehicles we have utilized over the past several years.

- On-Site Independent Team (Traditional VE Workshop)
- On-Site Integrated Team (VE Team, Design Team, Stakeholders)
- Virtual Independent Team (Traditional VE Workshop)
- Virtual Integrated Team (VE Team, Design Team, Stakeholders)

With an assumed constant expenditure of $75K per VE Study, the Average ROI (Static/First Costs) shows the dollars saved for each dollar expended on the VE Study. Understanding that we have a relatively limited pool of data, and that the project size and the composition of the VE team are uncontrolled variables that have not been statistically corrected, we do have real world data that verifies our experience facilitating these different types of Value Management Workshops.

Summarizing:

Study Type	Average ROI
On-Site Independent Team	17/1
On-site Integrated Team	26/1
Virtual Independent Team	29/1
Virtual Integrated Team	56/1

Table 3 – Performance Summary

While the performance of all the VE primary delivery vehicles is considered outstanding and certainly justifies the application of the Value Methodology to substantial projects of all types, the data shows that across all measured criteria the Virtual Integrated Team delivers superior performance.

No	Study Type	Date	DD	Participants	Project Value (PV) ($M)	VE Ideas	Proposals Developed	Max Potential First Cost (M)	Accepted (M)	PV/MPFC %T	Acceptance MPFC/M %T	VE Study Cost (000)	ROI (M/VE cost)
1	On-Site Independent Team	Feb-14	35%	6	$30	43	26	$2.00	$1.20	4%	60%	$0.70	17/1
2	On-Site Independent Team	Nov-17	35%	8	$39	37	36	$2.50	$0.94	2%	38%	$0.70	13/1
3	On-site Independent Team	Sep-19	35%	7	$40.60	46	30	$2.40	$0.30	1%	13%	$0.70	4/1
4	On-Site Independent Team	Sep-19	35%	10	$96.40	37	27	$9.80	$3.20	3%	33%	$0.70	46/1
5	On-Site Independent Team	Jun-20	35%	12	$4.20	43	31	$0.23	$0.14	3%	61%	$0.70	2/1
	Average			8.6	$42.04	41	30	$3.39	$1.16	3%	34%	$0.70	17/1
6	On-site Integrated Team	Aug-19	35%	32	$67	53	36	$6.60	$2.30	3%	35%	$0.70	33/1
7	On-site Integrated Team	Nov-21	35%	74	$50.50	21	17	$1.90	$1.90	4%	100%	$0.70	27/1
8	On-site Integrated Team	Mar-22	35%	44	$19.60	37	20	$1.07	$0.12	1%	11%	$0.70	2/1
9	On-site Integrated Team-Hybrid	Feb-23	35%	26	$10.20	34	22	$0.72	$0.48	5%	67%	$0.70	7/1
10	On-site Integrated Team-Hybrid	Mar-23	35%	31	$108.00	64	35	$4.50	$4.32	4%	96%	$0.70	62/1
	Average			41.4	$51.06	42	26	$2.96	$1.82	4%	62%	$0.70	26/1
11	Virtual Independent Team	May-20	35%	9	$110	57	35	$9.50	$7.90	7%	83%	$0.70	113/1
12	Virtual Independent Team	Feb-22	35%	8	$18.80	19	15	$0.75	$0.14	1%	19%	$0.70	2/1
13	Virtual Independent Team	Apr-21	35%	7	$55	25	16	$0.73	$0.45	1%	62%	$0.70	6/1
14	Virtual Independent Team	Apr-22	35%	8	$9	47	39	$3.60	$0.95	11%	26%	$0.70	14/1
15	Virtual Independent Team	Jan-24	35%	8	$9	9	8	$0.97	$0.67	8%	69%	$0.70	9/1
	Average			8.0	$40.24	31	23	$3.11	$2.02	5%	65%	$0.70	29/1
16	Virtual Integrated Team	Apr-20	35%	19	$84.30	34	20	3.9	$3.60	4%	92%	$0.70	51/1
17	Virtual Integrated Team	May-20	35%	22	$17	31	16	$1.30	$0.92	5%	71%	$0.70	13/1
18	Virtual Integrated Team	Jun-20	35%	43	$153	40	19	$2.10	$1.40	1%	67%	$0.70	20/1
19	Virtual Integrated Team	Jun-20	35%	24	$32	19	8	$1.30	$1	3%	77%	$0.70	14/1
20	Virtual Integrated Team	Jul-20	35%	37	$263	38	20	$0.65	$0.21	0.1%	32%	$0.70	3/1
21	Virtual Integrated Team	Oct-20	35%	70	$62	26	17	$6.50	$3.40	5%	52%	$0.70	49/1
22	Virtual Integrated Team	Nov-20	35%	31	$8.10	68	44	$0.99	$0.61	8%	62%	$0.70	9/1
23	Virtual Integrated Team	Nov-20	35%	25	$10.50	28	16	$0.95	$0.28	3%	29%	$0.70	4/1
24	Virtual Integrated Team	Feb-21	35%	39	$10.40	12	12	$1.50	$1.30	13%	87%	$0.70	19/1
25	Virtual Integrated Team	Apr-21	35%	31	$75	25	23	$0.15	$0.85	1%	559%	$0.70	12/1
26	Virtual Integrated Team	Jan-22	35%	47	$78.60	23	23	$41.20	$34.20	44%	83%	$0.70	489/1
27	Virtual Integrated Team	Feb-22	70%	22	$74.04	15	12	$1.96	$0.53	1%	27%	$0.70	8/1
28	Virtual Integrated Team	Feb-22	35%	31	$18.00	19	15	$0.75	$0.01	0%	2%	$0.70	1/1
29	Virtual Independent Team	Jun-22	35%	24	$11	18	12	$1.44	$0.44	4%	30%	$0.70	6/1
30	Virtual Integrated Team	Sep-22	35%	40	$180	54	24	$3.64	$3.28	2%	90%	$0.70	47/1
31	Virtual Independent Team	Feb-23	35%	15	$33	33	19	$2.98	$2.50	8%	84%	$0.70	36/1
32	Virtual Independent Team	Feb-23	35%	19	$5	24	14	$1.96	$1.96	39%	100%	$0.70	28/1
33	Virtual Integrated Team	Apr-23	35%	17	$8.20	17	12	$1.53	$1.46	18%	95%	$0.70	21/1
34	Virtual Integrated Team	May-23	35%	33	$7	20	8	$0.14	$0.14	2%	100%	$0.70	11/1
35	Virtual Integrated Team	May-23	30%	12	$102	16	6	$5.00	$4.90	5%	98%	$0.70	11/1
36	Virtual Integrated Team	May-23	30%	27	$19	17	11	$1.20	$0.76	4%	63%	$0.70	70/1
37	Virtual Integrated Team	Jun-23	35%	24	$86	17	10	$16.00	$1.20	1%	8%	$0.70	17/1
38	Virtual Integrated Team	Jun-23	30%	90	$255	57	36	$35.00	$32.90	13%	94%	$0.70	470/1
39	Virtual Independent Team	Feb-24	10%	16	$28	21	10	$0.19	$0.19	1%	100%	$0.70	3/1
40	Virtual Integrated Team	Feb-24	35%	39	$27	39	27	$3.08	$0.05	0%	2%	$0.70	1/1
41	Virtual Integrated Team	Mar-24	100%	39	$120	50	32	$13.42	$4.76	4%	35%	$0.70	68/1
42	Virtual Integrated Team	Apr-24	30%	38	$110	29	20	$2.32	$2.12	2%	91%	$0.84	30/1
	Average			32	$69.52	29	18	$5.60	$3.89	6%	69%	$0.71	56/1

Table 3 - VE Primary Delivery Vehicle Performance

Conclusion

A Value Management workshop is a communication vehicle focused on improving the value of the project.

- Virtual VE workshops can be highly effective Collaborative Tools when coupled well-developed on-line communication activities and experienced co-facilitators
- We need to revise the way we implement the Creative Phase to reflect the developed research
- Virtual Integrated Team = Superior Results

What the Integrated Team and the Virtual VE workshop do well:

- Establish a new paradigm for the project workshop
    - An expanded Integrated Team (VE Team, Design Team, Stakeholders)
    - A collaborative effort separated from the independent effort
- Expand participation of key individuals
    - Increase the number of viewpoints
    - Higher quality solutions
- Increased Participation in the Collaborative Process
- Improved ownership of the results
    - Participation in the process drives ownership
- Better utilization of resources
    - Allow people to better manage their workflow
    - Eliminate travel expense and time
    - Reduce the total cost of VE workshops

Increase the utilization of the VM Methodology

As our data demonstrates, with the approach described, the Integrated Team combined with the Virtual Delivery Model can greatly improve the performance of a Value Management workshop.

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