VALUE MANAGEMENT & VALUE IMPROVING PRACTICES

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ABSTRACT

We believe the potential application of the Value Methodology to Construction Project Value Improving Practices (VIPs) is significantly underutilized in Major Capital Investment & Construction Projects. This is particularly the case in Oil & Gas, Chemical, Refining and Process industries. A significant opportunity exists for effective Value Engineering practitioners to support this global industry.

The key to capturing this market is to "Define Needs," then "Apply (the VE) Methodology" ... regardless of whether the name "Value Engineering" is prominent in these high impact studies! This paper will directly address, and coach, as to how the VM methodology can be used to first, determine which VIP's to address on a given project, then show how by focusing on the VIP's outcome, move VM beyond the traditional "cost reduction" image in capturing other value adding attributes. We hope the content of the paper will intrigue both Practitioners and Clients as to emerging opportunities for applications of our craft to support broad business and social results

INTRODUCTION:

Several project "Value Improving Practices," henceforth referred to as VIPs, including Value Engineering, have been defined and their potential impact assessed by such companies as Independent Project Analysis,' (IPA), a prestigious and highly respected international benchmarking company.

Topics the paper will address include:

- VIP's in the Stage Gate Process
- Placing Value Methodology in VIP delivery Context
- Exhibit Simplified Examples from Case Studies (graphics are somewhat self-explanatory)

DISCUSSION:

"Value Improving Practices," (VIPs), including Value Engineering, have been defined and their potential impact assessed by such companies as Independent Project Analysis,' (IPA).

While application of these VIPs is identified as being pivotal to sustaining a successful company in the capital projects market, there are few detailed, consistent & repeatable processes for project teams to use while delivering results from several of these VIPs other than Value Engineering. The Value Methodology has a definite place in this regard to deliver a consistent, creative approach to working through several of the VIPs.

In "Integrated Decision and Value Management," IDVM ®, a powerful blend of the Value Methodology, Decision Analyses, Project Management and Decision Analyses tools have been proven to consistently deliver significant measurable business results when applied to the selected construction industry VIPs including VE.

Some of the other VIPs are:

- Setting Business Priorities
- Design to Capacity
- Technology Selection
- Waste Management
- Constructability

This paper shares these methods of VE/VM application to broader VIPs so as to encourage practitioners to pursue learning and competence in application of the Value Methodology on VIPs to meet this significant opportunity to contribute to our clients' business results.

In identifying VE as a VIP, many project teams have viewed VE as a technique for reducing capital and operating expenses. VE has sustained a high success level in this role and is sometimes considered by other VIP advocates as a competing VIP process.

However, Value Engineering, in its broader focus, the Value Methodology, is an excellent thinking and analyses methodology for addressing and resolving the challenges of other VIP initiatives, in a way that keeps them in balance.

NOTES ON "BENCHMARKING"

One of the major "Benchmarking" service organizations is IPA. According to IPA the outcomes of projects can be predicted by understanding the historical relationship between project drivers (characteristics, technology, and project management practices) and the project's final outcomes.

IPA asserts project histories contained in databases act as clear guides to understanding and quantifying the relationship between project inputs and project outcomes. Further, while every project is unique in some respect, it is possible-with sufficient information-to compare performances on an even basis.

The type of information IPA collects in interviews with project team members include:

General information on Project, Project Management information, Project Definition and Estimates / Actual results on Costs, Operational Performance, Schedule, Technology and documentation application of the number of potentially applicable **Value Improving Practices** which were actually performed.

According to IPA "This project-specific comparison is important for understanding and quantifying the cost, schedule, and operational performance trade-offs necessary to produce a project that is optimal to the particular business circumstances."

We believe a major challenge is in the actual delivery methods for the chosen VIPs. The Value Methodology, together with other proven Disciplines, can "supercharge the impact of VIP work in Construction & Capital Projects!

What is a "Value Improving Practice?"

Value Improving Practices, (VIPs,) when applied ought to return measurably improved project outcomes (e.g., cost, operability, schedule, reliability, safety, etc.). A VIP does not improve one outcome at the expense of another. **Further the collective application of the VIPs should add positive impact on FULL CYCLE RETURN ON INVESTMENT** … rather than "Checking a Box" in a list of Project Management behaviors … as does occur in many cases.

A key attribute associated with this description is that the practices be applied in a systematic approach with a methodology that allows them to be repeatable and consistent from project to project when they are applied. Herein lies the opportunity for the Value Methodology (Augmented by Decision Analyses tools) to deliver a consistent, proven and repeatable process to implement the VIPs in a fashion that delivers measurable results!

To best use its resources, the company refines its list of VIPs as those that will generate the greatest return on the portfolio of work. In doing this, a company should determine what practices they believe add value within their system and determine how best to adapt them to their culture and get the optimum results from applying them.

For example, the Value Engineering Pre-Event is an excellent methodology for implementing the VIP of "Setting Business Priorities" for a Project team. This is addressed in the "Understanding Clients' Needs Section"

Example VIPs

Each company tends to have their own view of the exact interpretation of VIPs. Some companies have "extra" VIPs in addition to those normally tracked in the benchmarking data sets across industry. The following examples include some of the VIPs most used and several of those that can benefit from application of the Value Methodology and from toolsets generally used in the Job Plan.

VIPs that we have found particularly suitable to Value Methodology use have been noted by **(VMO)** for "Value Methodology Opportunity!" (To avoid confusion we noted **(VMO)** alongside "Traditional Value Engineering" below.)

Setting Business Priorities (VMO): A communication process that identifies the decision maker's & stakeholders' requirements and the expectations associated with a business opportunity and translate them into measurable project objectives, ranked according to their relative importance to the business strategy. It puts the decision makers & stakeholders of the business opportunity in synchronization with the project team who are charged with delivering the business results.

Customized Standards & Specifications: A method for selecting the codes, standards and specifications most applicable to the selected project, making necessary modifications to meet project goals and objectives, and ensuring that the selection does not exceed actual project specific requirements.

Waste Minimization and Management (VMO): A formal and disciplined process-stream-by-process-stream analysis of ways to eliminate the production of waste products or non-useful streams from a process, as well as the methodology for managing any remaining waste streams.

Design to Capacity (VMO): A structured methodology to address design capacity against business needs and to eliminate "hidden capacity." It focuses on the precise alignment of units, systems, equipment and bulk within a range of capacity performance. The outcome of the Design to Capacity Value Improving Practice should provide the base case process design for your detailed design.

Technology Selection (VMO): A systematic search both inside and outside the company for manufacturing/processing technology that may be superior to that currently employed on projects to ensure that the technology used is the most competitive available technology aligned with the Projects Business Objectives.

Traditional Value Engineering (VMO): A facilitated, structured workshop to identify and achieve the needed functionality of a selected work process, facilities design, or equipment design at the lowest life cycle cost.

Process Simplification (VMO): A facilitated, structured workshop focused on simplifying development, facility, processing, or equipment requirements while satisfying needed functionality to deliver business outcomes.

Constructability (VMO): A systematic method that enables a project team to optimize the use of construction knowledge and experience in planning, engineering, design, procurement, fabrication and installation to achieve overall project and safety objectives.

Energy Optimization: This practice is an analytical study (utilizing "pinch technology") in order to focus on energy options. The intent of energy optimization is to identify the optimal energy

types and energy usages within a process and/or site by considering economic trade-offs and overall operability.

Facility Systems Performance: This practice provides a form of computer modeling used in forecasting performance to balance sales, operation and maintenance needs at the best cost. It provides a project team a more effective means of assessing, in advance, the cost/benefit impact of changes in design, operations, spares, training and/or maintenance of a facility.

Predictive Maintenance: An approach to maintenance whereby all maintenance techniques (breakdown, preventative, predictive, etc.) are integrated to achieve project objectives and maximize business value. Maintenance Excellence enhances business value through increasing uptime, product quality, yield, and capital productivity.

Life Cycle Engineering Information Management (more than 3D Computer Aided Design) The management of engineering information (including drawings, documents and data) using computer systems so that it can be of value throughout the life cycle of the asset, including the project phases, operations and maintenance and final decommissioning and demolition.

BACKGROUND ON VIPS & STAGE Gate processes.

While many companies have "Stage-Gate" Project Decision making processes, essentially conforming to the "FEL 1, 2, 3, Project Implementation, Operate." However, some have more "Project Management / Business Focus Stages."

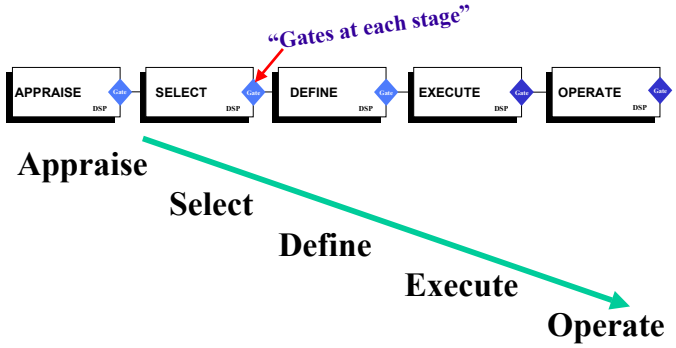
Note: "FEL" above refers to "Front End Loading"

The following section places example VIPs in a representative "Stage Gate" process.

Many clients have "Stage / Gate business processes to enable some clarity of thought in using "Thinking Methodologies" to improve their likelihood of achieving their goals. **Figure 1** depicts one such process.

In the example process of stages and gates, shown the company gradually invests resources in a series of Stages and Decision "Gates." The company's teams use various value improvement methods including Value Engineering.

The rational for such a progression, can be seen from the classical Influence vs. Expenditures curves



As we Monetize an Asset from "Ideation" to "Revenue Generation" … we do so in a series of definable Stages … associated with Major Funding decisions.

(FEL 1, FEL 2, FEL 3, Implement, Operate)

Figure 1

shown in **Figure 2**

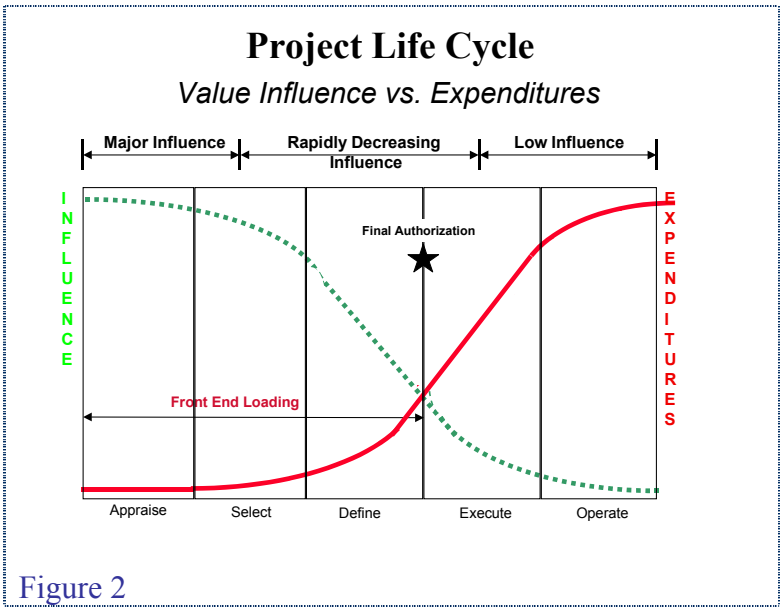


Figure 2

As we move further into investing in a capital project we lose the ability to influence / change direction of the project.

Some of the various Value Improving practices used in advancing a capital project are shown in **Figure 3**.

In engaging & serving such companies, the VE/VIP Practitioner is expected to be familiar with all of the various Value Improving Practices and is expected to recommend as appropriate ... and in many instances, is expected to deliver a tailored methodology, selected to meet the project team's specific needs.

From an aspect of assurance of quality in progression of a Capital Investment, strategically managed companies will focus on different value measures to improve as the potential asset / project is brought to fruition. **Figure 3.**

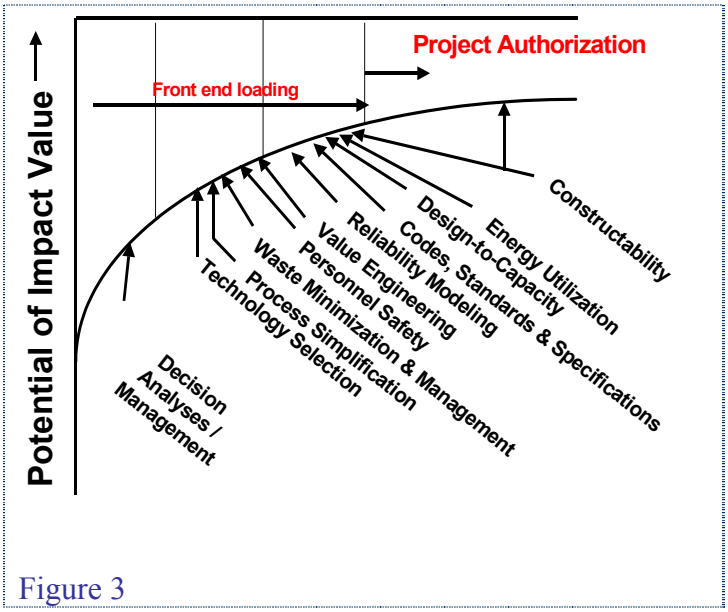


Figure 3

The VIPs depicted in **Figure 3** do not exactly match the list of VIPs on Page 5. This is not unusual. Companies tend to "Mix & Match" VIPs and develop there own internal "VIP names" to suit their project management culture. However the following VIPs tend to be universally recognized. :

- **Setting Business Priorities**
- **Design to Capacity**
- **Technology Selection**
- **Waste Management**
- **Value Engineering**
- **Constructability**

The "improvement in quality" focus, which is expected to aid Project Teams in delivering measurable results, **Figure 3,** will require different types of facilitated intervention. Without question, the Value Methodology can, play a major part in delivering that quality / value improvement. However, it is not the only methodology used. The VE/VIP Practitioner is well counseled to be aware of, and competent in, the others, including Decision Analyses & Framing Methods, particularly in the VIP of "Setting Business Priorities" in Project/Investment stages of APPRAISE" & "SELECT" (or "FEL 1" & "FEL 2")

If we use the "Stage Gate" example process shown in **Figure 1** a basis, we can place potential Value Methodology Opportunities in the context shown in **Figure 4**. We have chosen not to select "Custom Standards & Specifications" as a significant VM opportunity, however the framing and discovery parts of the Job Plan can be very useful in uncovering the true functions to be achieved by selected Specifications & Standards and can often aid teams in discussing options.

PLACING THE VALUE METHODOLOGY IN THE VIP DELIVERY CONTEXT

EXAMPLE VALUE IMPROVING PRACTICE	Clear Applicability of the Value Methodology	Typical "Stage" for VIP Application	**Chosen in our Example**
Setting Business Priorities	✓	**Select - Define**	✓
Custom Standards & Specifications			✓
Technology Selection	✓	**Select Define**	✓
Design to Capacity	✓	**Define -**	✓
Waste Minimization & Management	✓	**Select Define**	✓
Process Simplification	✓	**Select Define**	
Value Engineering	✓	**Select Define**	✓
Constructability	✓	**Define -**	✓
Energy Optimization		**Define**	
Facility Systems Performance		**Define**	
Predictive Maintenance		**Define**	
Life Cycle Engineering Information Management		**Define**	

Figure 4

ASSESSING THE CLIENTS' NEEDS

When the VE/VIP practitioner embarks upon a "Client needs assessment," it is simply not enough to ask of the client "Would you like a Value Engineering intervention?" Rather the VE/VIP practitioner has to place the impact of Value Engineering and other methods in the context of the company's project management & business process.

We do have good "Pre-Event" or "Discovery" methodologies available to us to set up a VE study often used when we have ascertained that VE is appropriate. These discovery methods can be effectively used to uncover the appropriate Value Improving Practices ... even if they do not include Value Engineering!

We must listen carefully, probe definitively, and if required, we must be comfortable in recommending an intervention / analyses process far removed from the VE job plan. However one may recommend to a client, (who may have "asked for Value Engineering" ... perhaps because they didn't understand the method and outcomes in depth,) ... that they really need a different analytical process!

SELECTING POTENTIALLY APPLICABLE VIPS

Example Project Using the Value Methodology Pre-Event to Deliver Setting Business Priorities VIP
Contractor FEED

	"WORST ACCEPT-ABLE"			Value Matrix						"REALLY GOOD"	
	1	2	3	4	5	6	7	8	9	10	Ref. P/C Weight
Schedule	1-Sep-04			1-Jul-04						1-May-04	21%
BASE A1				4							
CAPEX (1)	120%				100%					80%	16%
BASE A2					5						
Operability	1						As Per Design			10	14%
BASE A3							7				
Meets Function Specs	1									10	6%
BASE A4				4							
Up Time Reliability	97			98			99			99.8	7%
BASE A5						6					
Project Organization	Marginal			Informal						Best Practice	0%
BASE A6				4							
Emissions	Appicable Regs									Company Policy	4%
BASE A7		2									
Design Fatigue Life	100						250			1000	21%
BASE A8							7				
Opex	1.5		1							0.8	11%
BASE A9		2									

Figure 5

By using such tools as the Value Attribute Matrix shown in **Figure 5** we can discuss which VIPs may be appropriate to move the Project Base Case Attributes (shown above in the "BASE A1, BASE A2, etc line)… higher on the "Scale of Goodness: and place the VIPs in an order of priority with guidance from the Paired Comparison Project Team Exercises, (Kaufman, Fallon, McCuish)

Delivery of the Value Improving Practices can be accomplished first by clear thinking to develop a VIP Value Focus frame prior to engaging work … then reviewing that frame within each VIP. The following suggests methodology to facilitate this concept as part of the team's normal workload, rather than additive.

When teams are first confronted with the charge to "Deliver Value Improving Practices" or VIPs, the task often appears daunting and begs such questions as "Why, how will that really help?"… Or perhaps elicits comments like "We do that stuff as part of our normal work!"

Using the methodology outlined in this paper, the team may integrate the VIP work into their normal activities … and also may exhibit the REAL Value Improvement they have achieved in use of the selected VIPs!

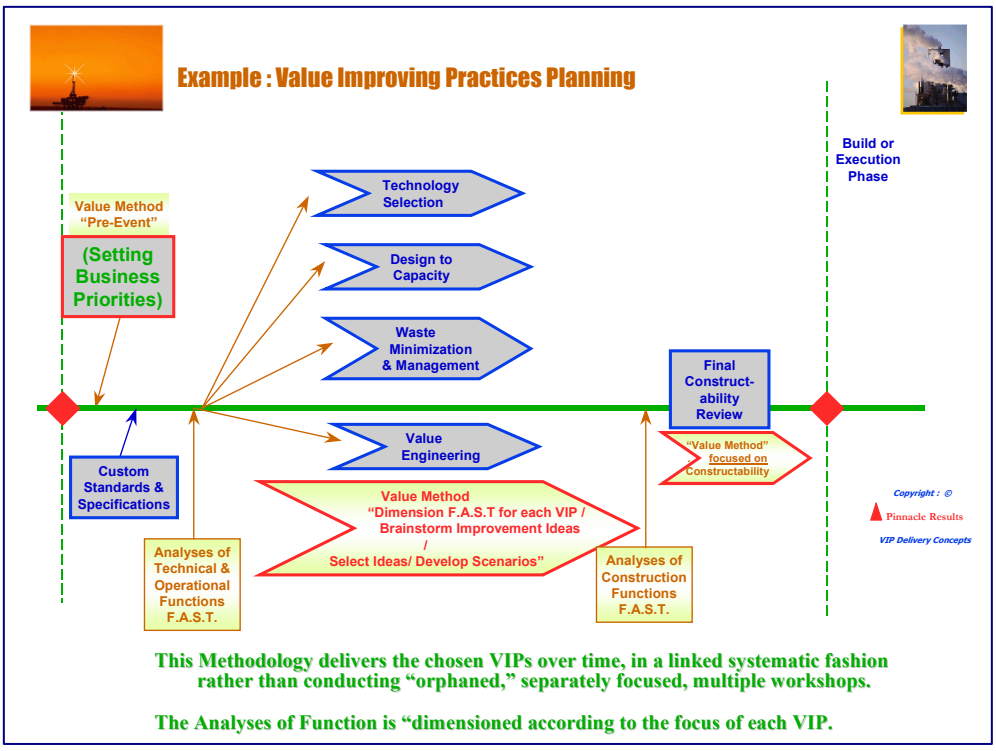
The appropriate VIPs are worked over time in an integrated fashion rather than "orphaned" in individual workshops or studies. In most cases this approach has actually caused less total work, and in one recent case significantly reduced the overall FEED cost, in addition to measurably improving the Project at hand.

Figure 6 depicts an example set of VIPs chosen by a project team.

EXAMPLE of Potentially integrated VIPs

Figure 6

The team first works through "Setting Business Priorities" and "Custom Standards and Specifications." We have noted the use of the Value Methodology for working through framing of the "Business Priorities."



Using our "Integrated VIP delivery" approach, the core Guidance Graphic for addressing these VIPs, or "F.A.S.T," is an overall reference graphic. It is used with each of the remaining VIPs, other than "Constructability."

For Constructability a separate, yet associated, F.A.S.T. is developed to depict the Functions to be achieved in the actual Construction & Commissioning work.

Essentially this method provides the team with a consistent graphic to easily reference with respect to Value Focus of Functionality during the application of the remaining VIPs.

We believe the hallmark of our method is clear communication of Functionality, which reduces the total workload for the team … and should deliver measurable value to the project.
Let's say, for example, the team had chosen the VIPs shown in **Figure 6, & Figure 7** and wished to integrate them, rather than have individual workshops / meetings to apply rational thought to delivery of the VIPs.

Value Focus of chosen VIPs

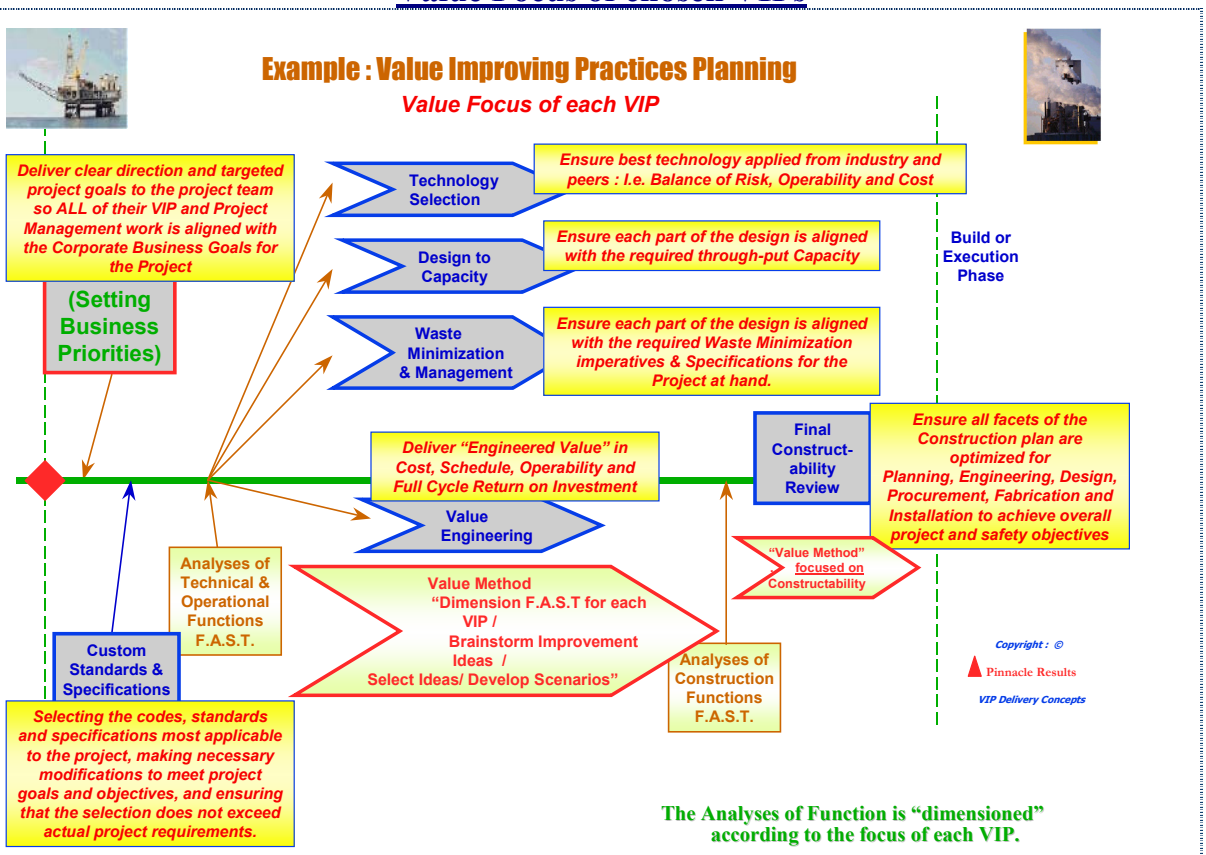


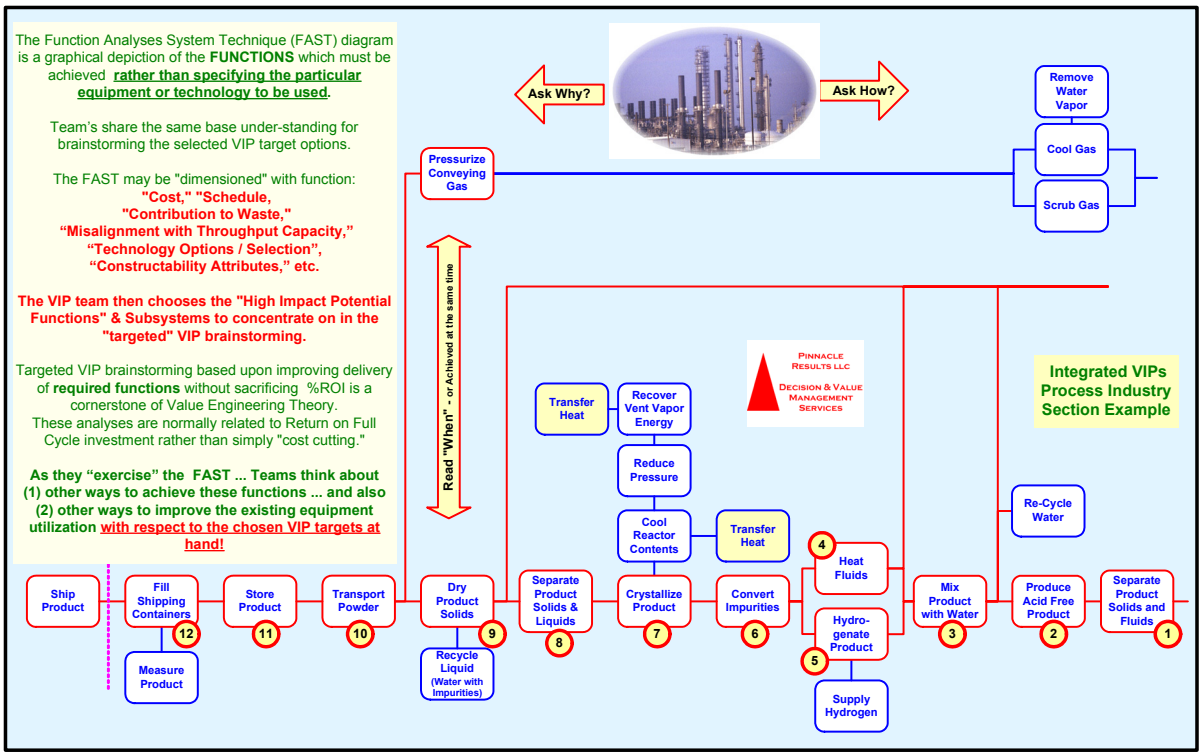
Figure 7

We would assume the team has conducted a "Project Framing" or "Setting Business Priorities" workshop at the start of the "Project Stage, and have discussed the range of acceptable outcomes of application of the VIPs … using the Value Methodology toolsets."

The yellow boxes in **Figure 7** depict the Value Focus of each of the chosen Value Improving Practices for the Project. While **Figure 7** may appear a little overwhelming at first glance, the following pages show simplified examples of a rational and integrated methodology for working through these Value Improving Practices as part of the work of the project team.

The methodology is designed to capture potential Value Improvement and to aid the team in achieving the VIPs … working with effective VE/VIP Practitioners & Company staff.

Each VIP is addressed in turn; following "Setting Business Priorities" & "Custom Standards & Specifications," the analyses of Required Functionality will provide an integrated link to all VIPs and will aid the team in considering a consistent "business results alignment." However the VIPs chosen may be addressed in the SAME workshop, or Study, without the need for multiple separate VIP meetings!



EXAMPLE Simplified Case Study Figure 8

Figure 8 Shows an Example F.A.S.T., with only the major logic path functions numbered for simplicity.
The Graphic on the previous page, in **Figure 8,** is extracted from a larger and more complete F.A.S.T. and has been changed and the equipment list changed, to ensure confidentiality. However it will serve to exhibit the concepts of multiple-use, as the Project Team focuses on each of the chosen VIPs.

Traditional "Dimensioning" of the F.A.S.T. with Total Installed Cost / Function

Function / Hardware		Equip $ Cost	TIC Multi-iplier	Total Installed $ Cost (Millions)	12 Fill Shipping Containers	11 Store Product	10 Transport Product	9 Dry Product Solids	8 Separate Solids & Liquids	7 Crystalise Product	6 Remove Impurities	5 Hydro-Genate Product	4 Heat Fluids	3 Mix wirh Fluids	2 Product Free Product	1 Separate Solids & Fluids
	Major Equipment															
1	A		1.00	$ 4.0					20.0%	20.0%	20.0%	20.0%	20.0%			
2	B		1.00	$ 4.0	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
3	C		1.00	$ 4.0			33.3%	33.3%						33.3%		
4	E		1.00	$ 9.5								33.3%			33.3%	33.3%
5	F		1.00	$ 93.0	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%		12.5%	12.5%	
6	G		1.00	$ 36.0		33.3%			33.3%	33.3%						
7	H		1.00	$ 24.8		16.7%			16.7%	16.7%		16.7%	16.7%			16.7%
8	I		1.00	$ 32.7		20.0%	20.0%	20.0%	20.0%	20.0%						
9	J		1.00	$ 10.4	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%	12.5%	12.5%		
10	K		1.00	$ 6.1			25.0%		25.0%			25.0%			25.0%	
			1.00	$ -												
			1.00	$ -												
			1.00	$ -												
			1.00	$ -												
			1.00	$ -												
			1.00	$ -												
			1.00	$ -												
TOTAL		$ -		$ 224.5	$13.3	$23.0	$22.7	$21.1	$38.3	$23.8	$14.1	$22.9	$6.6	$14.6	$16.7	$7.6

EXAMPLE ONLY
A FAST Diagram traditionally dimensioned with $ Cost.
The same FAST may also be dimensioned with the target Attributes of Applicable VIPs eg. Waste, Capacity, Simplification, Technology,

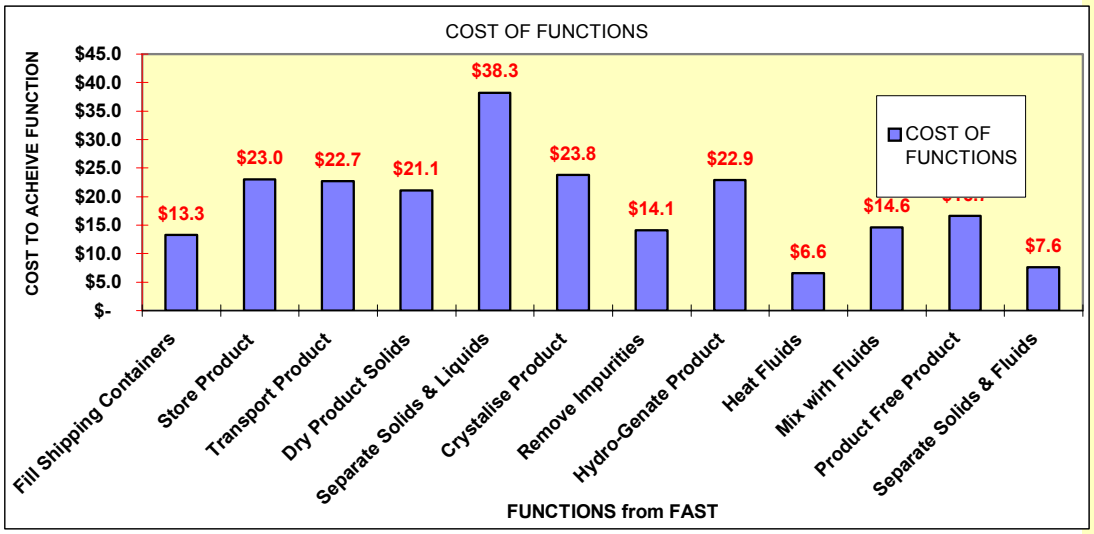


Figure 9

If we then interrogate the FAST with contribution to Waste or to Emissions we may get a graphic as in **Figure 10** to aid team discussion. This gives the team a touchstone to hold creative discussions and focus upon the **VIP of Waste Minimization**. **The REST OF THE VE METHODOLOGY NOW APPLIES!**

Function / Hardware			Contibution to Waste / Emissions/ Heat loss in Appropriate Units / Year	12 Fill Shipping Containers	11 Store Product	10 Transport Product	9 Dry Product Solids	8 Separate Solids & Liquids	7 Crystalise Product	6 Remove Impurities	5 Hydro-Genate Product	4 Heat Fluids	3 Mix wirh Fluids	2 Product Free Product	1 Separate Solids & Fluids
	Major Equipment														
1	A		5.00	20.0%		20.0%					20.0%	20.0%			20.0%
2	B		2.00	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
3	C		7.00			33.3%	33.3%						33.3%		
4	E		8.00								33.3%			33.3%	33.3%
5	F		12.00	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%		12.5%	12.5%	
6	G		45.00		33.3%	33.3%			33.3%						
7	H		13.00	16.7%	16.7%				16.7%			16.7%		16.7%	16.7%
8	I		22.00		20.0%				20.0%			20.0%	20.0%	20.0%	
9	J		55.00	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%	12.5%	12.5%		
10	K		12.00	25.0%				25.0%			25.0%			25.0%	
TOTAL			181.00	14.71	21.73	26.88	10.88	11.54	21.73	8.54	15.21	14.61	15.28	13.90	6.00

EXAMPLE ONLY:

A FAST Diagram dimensioned with Appropriate Waste or Emissions Contribution of FUNCTIONS

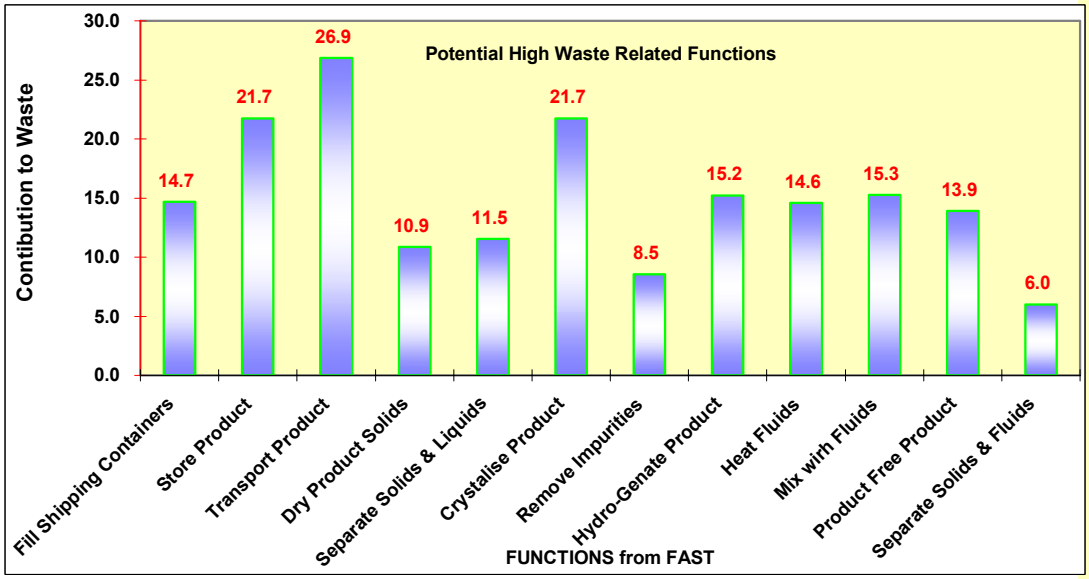


Figure 10

The Analyses also sets the team up to Exhibit Measurable impact of the VIP discussions. Similarly, if we then interrogate the FAST with potential for Technology Options, we may get a graphic as in **Figure 11** to aid team discussion. This gives the team a touchstone to hold creative discussions and focus upon the **VIP of Technology Selection**. Again **The REST OF THE VE METHODOLOGY NOW APPLIES!**

Function / Hardware			Ranking 1-10 for Potential Technology Options	12 Fill Shipping Containers	11 Store Product	10 Transport Product	9 Dry Product Solids	8 Separate Solids & Liquids	7 Crystallize Product	6 Remove Impurities	5 Hydro-Genate Product	4 Heat Fluids	3 Mix with Fluids	2 Product Free Product	1 Separate Solids & Fluids
	Major Equipment														
1	A		3	20.0%		20.0%					20.0%	20.0%			20.0%
2	B		6	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%	8.3%
3	C		9			33.3%	33.3%						33.3%		
4	E		2								33.3%			33.3%	33.3%
5	F		5	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%		12.5%	12.5%	
6	G		8		33.3%	33.3%			33.3%						
7	H		3	16.7%	16.7%				16.7%			16.7%		16.7%	16.7%
8	I		5		20.0%				20.0%			20.0%	20.0%	20.0%	
9	J		1	12.5%		12.5%	12.5%	12.5%		12.5%	12.5%	12.5%	12.5%		
10	K		1	25.0%				25.0%			25.0%			25.0%	
TOTAL			43.00	2.60	4.67	7.52	4.25	1.50	4.67	1.25	2.77	2.73	5.25	3.54	2.27

EXAMPLE ONLY:

A FAST Diagram team opinion as to the Potential Technology Options Focus of FUNCTIONS & Subsystems

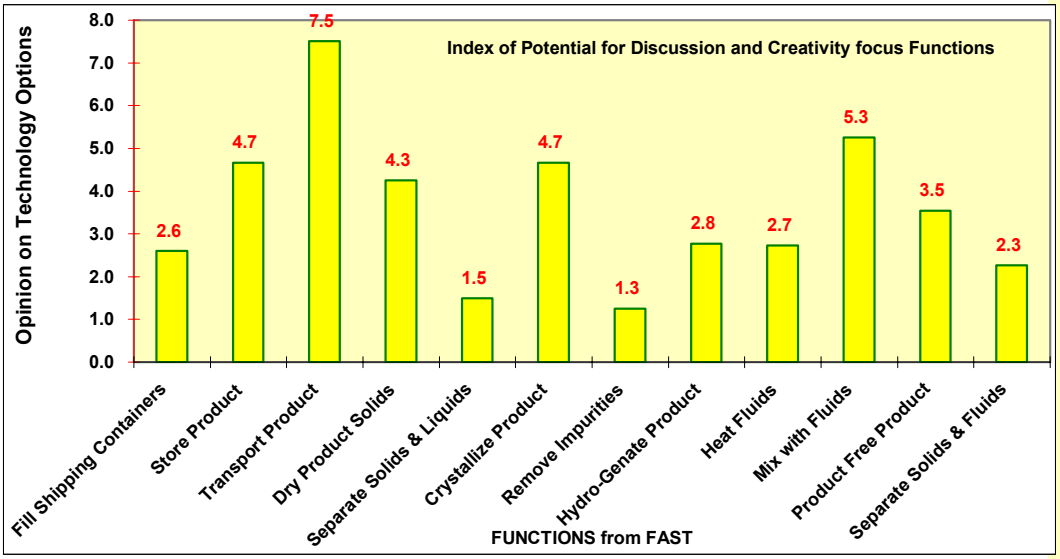


Figure 11

Rather than show more repetitive graphics, it's a reasonable extrapolation to visualize the similar approach we use for "Misalignment with Capacity," whether start-up or operating … and also for "Process Simplification" opportunities.

Again, a separate "Pre-Event" and separate F.A.S.T. is developed for the "Constructability" VIP … which focuses specifically on Construction and Commissioning improvement. It's rational to

wait until we have a good idea of "what we're going to build" to engage the "Constructability VIP, however, we can expect to consider some Constructability issues in earlier VIPs also.

CONCLUSION

In a recent discussion on VIP application, an Operations Representative from a Chemical Plant quipped, "Isn't it all Value Engineering?"

It would undoubtedly be a stretch to attempt to encompass all the VIPs as Value Engineering.

However, there clearly is a place for our Value Methodology to provide a detailed, consistent & repeatable process for project teams to use while delivering results from many of the Construction Industry VIPs, which are most often chosen.

Not only does the Value Methodology have a place in this regard to deliver a consistent, creative approach to working through several of the VIPs, … when used as part of a "Stage / Gate" Project Management Process, … it can aid teams to reduce their total workload and deliver Real Measurable Results … rather than "Checking of Boxes" as the VIPs performed!

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