Value Engineering: An effective and efficient tool for sustainable Irrigated Agriculture

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World population in the 2nd millennium
Imagination is more important than knowledge

» Albert Einstein
Changing our lives ….
Value Engineering

Creative, Systematic and Synergic teamwork
Value Engineering

- Value Engineering (VE) is an intensive, interdisciplinary problem solving activity that focuses on improving the value of the functions that are required to accomplish the goal, or objective of any product, process, service, project or organization.

Why use Value Engineering?

- Save
- Save
- Build
- Improve
- Satisfy
- Time
- Money
- Teamwork
- Quality
- Customer
Value Engineering

The main Function of VE is identifying and removing unnecessary cost.

VE is:
• System Oriented
• Multidisciplined Team Approach utilizing the Synergy of Teamwork
• A proven management technique encouraging Creativity
• Function Oriented (relates the function to value received)
• A short-term activity involving the Users and the Operation personnel

Reasons for unnecessary Costs (Poor Value)

- Shortage of time
- Misleading information
- Ambiguous goals, objectives, scope etc.
- Hasty decisions based on false assumption
- Lack of ideas
- Lack of funds
- Resistance to Change
- Unrealistic temporary circumstances
- Politics
- Bad habits and attitudes, beliefs
- Over design & Unrealistic safety factors
- Continues changing in the owner requirements
- Lack of communication coordination
- Using unsuitable standards & specification
- No LCC estimate ...... and more...
Value Analysis Development in GE

VE Timeline

1947
VE a success, training of employees and suppliers begins

1952
VE adopted by NASA ofc of facilities.

1955
Navy adds VE incentive clause

1959
SAE form in Wash. DC on Oct 22, 1959

1962
Army Corps of Engineers begins VE training

1964
Charles Bytheway invents FAST Modeling

1969
VE included in ASPR for military procurements

1970
First VE incentive clause published in Fed. Register, GSA staffs for VE.

1985
Larry Miles takes VE to Japan.

1988
Larry Miles dies.

20

Today

DOE Order 4010.1

OMB circular A-131 published requiring all Federal Agencies to use VE to identify and reduce non-essential costs.

OMB circular A-131 passes “Sunset Review”
Agencies adopted VE to:
- Save money and ensure cost-effectiveness,
- Improve quality,
- Eliminate unnecessary design elements, and
- Foster innovation and improve productivity.

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<td>369</td>
<td>431</td>
<td>385</td>
<td>388</td>
<td>378</td>
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<td>344</td>
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<td>300</td>
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<td>8</td>
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<td>9</td>
<td>8</td>
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<td>769</td>
<td>846</td>
<td>1128</td>
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<td>1043</td>
<td>1016</td>
<td>1115</td>
<td>3180</td>
<td>1650</td>
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<td>116</td>
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<td>318</td>
<td>206</td>
<td>164</td>
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<td>100</td>
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Original Design and VE Proposed Design
(Net Savings $4 Million – Accident Loss Reduction)
Value studies are mandatory in

- All US federal projects > $2 M
- All Japan projects > $2 M
- All Saudi Government Project > $5 M
- All RC of J&Y projects > $5 M
- All Saudi Aramco projects > $10
- also in UK, Germany, France, Australia, Korea, India, Malaysia, etc.
### International Value Organizations

<table>
<thead>
<tr>
<th>Year Founded</th>
<th>Country</th>
<th>Acronym</th>
<th>Name</th>
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</thead>
<tbody>
<tr>
<td>1977</td>
<td>Taiwan</td>
<td>VMIT</td>
<td>Value Management Institute of Taiwan</td>
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<tr>
<td>1983</td>
<td>South Korea</td>
<td>SKVE</td>
<td>Society of Korean Value Engineers</td>
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<tr>
<td>1984</td>
<td>Brazil</td>
<td>ABEAV</td>
<td>Associação Brasileira de Engenharia e Análise de Valor</td>
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<td>1984</td>
<td>Canada</td>
<td>CSVA</td>
<td>Canadian Society of Value Analysis</td>
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<tr>
<td>1990</td>
<td>Hungary</td>
<td>SHVA</td>
<td>Society of Hungarian Value Analysis</td>
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<tr>
<td>1990</td>
<td>Saudi Arabia</td>
<td></td>
<td>Arabian Gulf Chapter</td>
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<tr>
<td>1990</td>
<td>Spain</td>
<td>ACAV</td>
<td>Associació Catalana d’Anàlisi del Valor / FHOEVA</td>
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<tr>
<td>1991</td>
<td>Australia</td>
<td>IVM</td>
<td>Institute of Value Management</td>
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<tr>
<td>1993</td>
<td>France</td>
<td>AFAV</td>
<td>Association Française pour l’Analyse de la Valeur</td>
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<tr>
<td>1995</td>
<td>Hong Kong</td>
<td>HKIVM</td>
<td>Hong Kong Institute of Value Management</td>
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<tr>
<td>1998</td>
<td>Portugal</td>
<td>APAV</td>
<td>Associação Portuguesa para Análise do Valor</td>
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<tr>
<td>1999</td>
<td>Malaysia</td>
<td>MIVM</td>
<td>Malaysian Institute for Value Management</td>
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<td>2001</td>
<td>China</td>
<td>VESB</td>
<td>Value Engineering Society of Beijing</td>
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<td>No date avail</td>
<td>Italy</td>
<td>AIAV</td>
<td>Associazione Italiana per la gestione e l’Analisi del Valore</td>
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<tr>
<td>1984</td>
<td>The Netherlands</td>
<td>DACE</td>
<td>Dutch Association of Cost Engineers, Special Interest Group Value Management</td>
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VE Accomplishments in the Arabian Countries (Persian Gulf)

VE Studies …. Done

- More than 500 VE Studies
- More than 6,000 participants
- Done at the rate of 80-100/year
- Improved the Quality of our projects
- Saved More than $3 billion
- Saving ranged from 5-30%
- Rate of return is 1:100
- 7 official VE Program.

EMAAR, KING ABDULLAH ECONOMIC CITY RESORT COVE
EMAAR, KING ABDULLAH ECONOMIC CITY RESORT COVE

• Savings & Benefits:
Estimated Construction Cost $900 m
  • Initial Cost Savings $213 m (24%)
  • Stronger Image
  • Greater Flexibility
  • Energy Savings
  • Construction Simplification
  • Quality Improvement
• The VE process and procedures are well-defined and generally well-understood at most levels within an STA, including senior management. VE is recognized as an effective way to improve the performance of a project and/or reduce unnecessary capital and operating costs.

• A key ingredient to the success of the VE program is the quality (qualifications and experience) of the team leader and specialists.

• VE is more effective and influential on the performance, quality, and cost of a project when performed relatively early in the development of the project schedule.

Conclusions

• Training is necessary to maintain VE programs and the corporate enthusiasm to allocate resources to VE. However, training initiatives are typically influenced more by the overall funding of transportation programs.

• VE can effectively be integrated with or into other technical or management improvement approaches, such as asset management, road safety audits, context-sensitive design, and accelerated construction technology teams.
Potential Savings from VE

Return on Investment (ROI) for Value Engineering Projects

(Performance Based Budget Measures)

No engineering Change Revision
Document Revision
Re-Test/Re-qualification
Drawings Released
Tooling Changes

Net Savings from VE
Total Cost of VE Implementation

VE Implementation beyond this point results in a net loss.
VE Task Team/Quality Process Improvement Team

The Synergistic Effect of Value Analysis/Value Engineering
Thought for the day:

When you always do what you have always done - you always get what you have always gotten.

» Socrates

How?
Tools for Promoting Creativity in VE

The Technical FAST Model
The 7 Phases of The VE Workshop

VE Job Plan

Value Engineering Success Keys

Facilitator
Time
Information
Team
VE study of Mashhad Metro

The value study of Saadat Abad 400/230/63 KV substation
VE Team of Gharehsoy Zaringol irrigation project

LPAD

- Benefits:
  - Lesser pumping stations using current gravity potential
  - Lower Energy Consumption
  - Lower Construction and Life Cycle Cost
  - Higher Water Productivity and Higher Income

<table>
<thead>
<tr>
<th></th>
<th>LPAD</th>
<th>Base Case</th>
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<tbody>
<tr>
<td>Quality Factor</td>
<td>7077.66</td>
<td>5500</td>
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<tr>
<td>Income</td>
<td>1,784,120,964,000</td>
<td>1,731,364,289,000</td>
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<tr>
<td>(B/C)</td>
<td>1.5720</td>
<td>1.0090</td>
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<tr>
<td>Cost</td>
<td>1,134,937,000,000</td>
<td>1,715,921,000,000</td>
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<tr>
<td>Saving (Percent)</td>
<td>33.86%</td>
<td>-</td>
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<td>Water Productivity</td>
<td>6,525</td>
<td>6,096</td>
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<td>Value Index</td>
<td>2.0825</td>
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# Selected Proposals

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<tr>
<th>Rank</th>
<th>Code</th>
<th>Proposal</th>
<th>LCC* Saving</th>
<th>LCB* Increment</th>
<th>Quality Improvement</th>
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<td>1</td>
<td>DAP007</td>
<td>Changing the cultivation pattern</td>
<td>+0.1</td>
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<td>2</td>
<td>DAP037</td>
<td>Using More Intensive Cultivation Patterns in Flat and Steady Slope Lands</td>
<td>+3.4</td>
<td>+80.3</td>
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<tr>
<td>3</td>
<td>DAP045</td>
<td>Using 3 Different Cultivation Patterns for Humid, Normal and Arid Years</td>
<td>-3.5</td>
<td>+16.8</td>
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<td>4</td>
<td>POS001</td>
<td>Replanning the Operation Process Assuming Tribes System as Default</td>
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<td>6</td>
<td>POS013</td>
<td>Developing the Operation Process Based on the</td>
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<td>7</td>
<td>SIS028</td>
<td>Constructing Local Reservoirs</td>
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<td>8</td>
<td>SIS035</td>
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<td>SIS093</td>
<td>Reducing the Canal Coating Layer</td>
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<td>FP001</td>
<td>Attracting Individual Financers Besides Governmental Capital</td>
<td>?</td>
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Value Planning Study of Moghan Water resources
99% of trainees were enthusiastic about VE
Conclusions:

- Value engineering is an effective and efficient tool for identifying and removing unnecessary cost in Irrigation and Drainage Projects and ensuring SUSTAINABLE IRRIGATED AGRICULTURE.
More Information ……

• Books and Handbooks On VE
• A Value Story: Providing a Smoke & Heat, Detector System for an Historic Mansion
• Creative Sustainability (A documentary on Abbassi Historical Dam)
• SAVE Website: www.value-eng.org

• As mentioned in this presentation, application of VE methodology in many military projects in U.S. DoD has saved tens of Billions of Dollars, now it is time to use the technique for much more humane cause: Ensuring flood Security for billions of people all over the world.