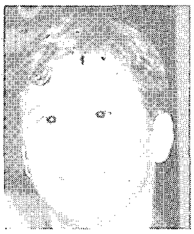
Why should Korea apply value analysis to its Public Works Sector

George-Hunter, Global Management Systems, Owner



Introduction

Public Works Sector programs are increasingly being criticized for delivering projects that **do not** achieve:

- perceived / expected project objectives,
- delivery within a reasonable amount of time, or
- costs within their budgeted amounts.

The lack of "***project buy-in***" is a common term to denote the project stakeholders' lack of confidence in one or all three of the above-mentioned bulleted points. Japanese highway projects have recently come under this criticism and Korea' s public works programs may fall under this same sphere of criticism. In order to avoid this, care must be taken to achieve a reasonable amount of project buy-in on Korean projects. The application of value analysis, modified for public works applications, can help achieve this.

A common project management failure on the previously mentioned projects is the focus on cost ***overruns*** and ***schedule delays*** without the necessary, relevant reference to the project scope. Hence the need for a project management tool that efficiently identifies and balances the project' s ***scope*** with the project' s ***schedule*** and ***costs***. Furthermore, project managers need to identify and analyze a ***large quantity of project alternatives with appreciable variances*** in project scope, schedule and costs to ensure project buy-in throughout the project delivery cycle.

Value analysis studies can provide this necessary, measured balance in cost, schedule and scope though the generation of a large quantity of innovative alternatives. This requires a motivated team of multi-disciplined professionals in cooperation with well-established project stakeholders stimulated and guided by the appropriate process. Value analysis techniques for public works projects have been espoused to the Korean Highway Corporation (KHC) over the last two years by the author in cooperation with IAM Corporation, culminating in a five-day value management training for selected KHC, IAM Co and KECC company employees last November. This article attempts to transmit some of the information provided to the KHC and others to KICEM' s members.

Value Engineering History and Background

Value engineering is a systematic, team approach to problem solving. Its intent is to find innovate, value-adding solutions to projects, processes and services. Value Engineering evolved out of the necessity to find substitutions for manufacturing materials that became scarce during World War II. In 1954, the U.S. Navy Bureau of Ships became the first agency to apply this analysis process to major construction projects.

Footnote: The term **value analysis, value management** and **value engineering** and will be used interchangeably throughout this paper

In 1959, the Society of American Value Engineers (SAVE) was incorporated in Washington, D.C. to unite practitioners and promote the growth of value engineering. The Society changed its name to SAVE International in 1997.

The Society officially defined value engineering as "the systematic application of recognized techniques which identify the function of a product or service, establish a value for that function, and provide the necessary function at the least overall cost. In all instances, the required function should be achieved at the lowest possible life cycle cost consistent with requirements and/or performance, maintainability, safety, and aesthetics."

Escalating construction and maintenance costs, combined with reduced revenues, led to an increased interest in value engineering by state and federal transportation agencies.

US Federal Value Engineering Programs

Preconstruction Value Engineering Studies

All US federal agencies, except the US Department of Transportation, have been are statutorily required to apply value analysis on their capital programs since the 1960's and 1970's. The US Department of Transportation joined the ranks of other federal agencies with the passage of the National Highway Systems Act of 1995 which resulted in the establishment of a value engineering provision (later codified in Section 106 of Title 23, U.S.C.) requiring the Secretary to "establish a program to require states to carry out a value engineering analysis for all projects on the National Highway System with an estimated total cost of $25,000,000 or more." FHWA published its regulation (23 CFR Part 627) establishing this program on February 14, 1997. The federal rule stipulates that the mandated project be analyzed by the established value methodology prior to the advertisement of the project; therefore study timing can place anytime within the project development phase but prior to the letting of the project.

Construction Value Engineering Studies

Value Engineering Change Proposals (VECP) programs differ from other VE programs in that the recommendation is developed by the construction contractor, who chooses whether or not to participate. The state's role becomes one of creating and managing a program that will be attractive to the contractors. This program is called by different names in the various states; for example, Value Engineering Incentive Provision (VEIP), Value Engineering Incentive Clause (VEIC) and Cost Reduction Incentive Proposal (CRIP).

Proven Results-Caltrans VA Program

George Hunter has been privileged to manage the Value Analysis (VA) Program in the California Department of Transportation (Caltrans) from 1995-2004, establishing it as leader in the utilization of value analysis techniques to improve capital programs. Some of the key reasons for this success are featured within the following pages.

VA Program Guidance

The Caltrans VA Program created several guides with detailed information on how to successfully carry out a VA study. These guides include information on unique Project Performance Measurements and the improve the efficiency of value studies as follows:

- Minimum study performance standards for VA study participants
- Reducing the learning curve for VA Team Leaders, VA Team Members and VA District Coordinators
- Enhances state of the art VA techniques and practices, such as project performance measurements
- Establishes implementation procedures.

Program Results

Chart 1 shows the improvements achieved for the Caltrans Program between FY 1996-2003. What is not shown in the graphs is the overall acceptance and requests to solve problems by Caltrans management and project managers. The results of this deliberate and concerted effort to improve the Caltrans VA Program will pay dividends for many years to come.

To implement a successful value analysis program in other parts of the world, the author recommends that value analysis programs in the public works sector establish the following

- The VA organization must be clearly structured.
- Their VA responsibilities must be clearly delineated.
- VA guidelines and manuals should be developed, used and maintained.
- In-house VA training should being provided.
- Program evaluation and auditing must be provided.
- VA specialists should be utilized.

Korean Value Engineering Background

Recent increases in construction costs on Korean public works projects, largely due to change orders caused by poorly elaborated design, led to a government study titled "Strategies for Achieving Efficiency in Public Construction Projects". Part of this statute's requirements was that government agencies utilize value engineering (VE) to improve project performance and reduce life cycle cost on infrastructure projects. The subsequent federal statute. "Management of Construction Technology", required that value engineering be performed on all major projects with a budget of more than USD $40 million and has subsequently been reduced to USD $10 million. This requirement has led the Korean Ministry and Construction and Transportation (KMOCT) to study the best practices and procedures, in order to standardize the implementation of the value engineering methodology into the project development process (planning, design and construction). This effort led to the KMOCT publication, titled the "Manual and Guideline for Value Engineering for Constructed Facilities" and to the development of a "Database for Value Engineering Suggestions" which will allow public/private institutions and agencies to share data. In response to these efforts, construction companies and academic institutions have actively conducted research on value engineering and life cycle cost (LCC) analyses applicable to the design and construction of public works projects.

Value Analysis Case Studies

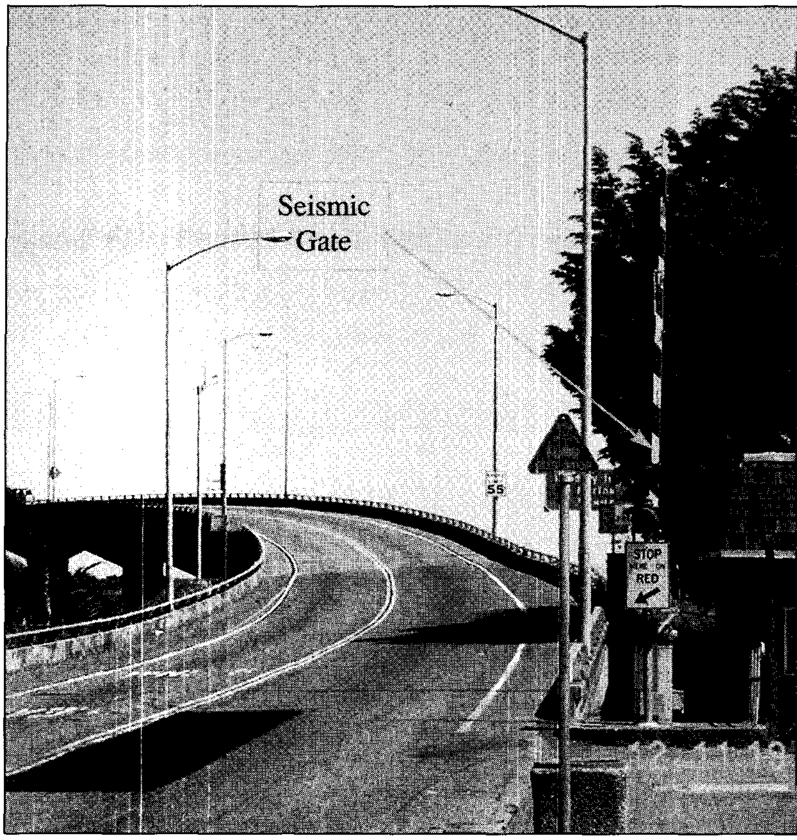
Three case studies shown at the end of this article demonstrate how value analysis can improve the scope, schedule and costs on public works projects through the utilization of appropriate project analysis and stimulation of creativity.

Chart 1 : Caltrans VA Program- Capital Projects (1996-2003)

CATEGORY	ITEM	FISCAL YEAR 1996	1997	1998	1999	2000	2001	2002	2003	TOTALS/ AVERAGE
NO. OF STUDIES	Studies Planned in Given FY	84	46	81	53	49	50	53	55	471
	Studies Started in Given FY	18	26	31	30	26	33	23	11	198
	Reported Studies w/ Implementation Results	18	26	19	25	21	29	37	30	205
	Study Completion Rate	21%	57%	38%	57%	53%	66%	43%	20%	42%
COMPLETED STUDIES SAVINGS	Completed Studies Project Cost (Millions)	$1,292	$2,069	$1,823	$2,040	$1,420	$2,067	$2,394	$2,650	$15,756
	Recommended Savings (Millions)	$156	$512	$409	$1,044	$703	$536	$373	$281	$4,014
	Implemented Savings (Millions)***	$104	$141	$155	$117	$66	$114	$173	$152	$1,022
	Average Project Initial Cost Reduction	8.0%	6.8%	8.5%	5.7%	4.6%	5.5%	7.2%	5.7%	6.5%
STUDY RECOMMENDATIONS	No. of VA recommendations	117	165	206	296	233	193	290	187	1687
	No. of Implemented VA Recommendations	39	74	56	105	74	64	75	58	545
	Implementation Rate *	33%	45%	27%	35%	32%	33%	26%	31%	32.3%
STUDY COSTS/ ROI	Study Costs (Millions)	$0.720	$2.267	$1.111	$1.251	$1.463	$1.714	$1.898	$1.923	$12.3
	Return on Investment **	144:1	62:1	140:1	94:1	45:1	67:1	91:1	79:1	90:1
VALUE STATISTICS	Accepted Performance Improvement	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.	11.4%	12.0%	8.0%	10.5%
	Accepted Value Improvement (Performance/ Project Costs)	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.	18.3%	68.0%	11.0%	32.4%
	(Accepted Value Improvement / Study Costs) X 1,000,000	Not avail.	Not avail.	Not avail.	Not avail.	Not avail.	320:1	923:1	182:1	475:1

* No. implemented alternatives/ No. of proposed alternatives (Construction Costs only)
** Implemented Savings/ Study Costs (Construction Costs only)

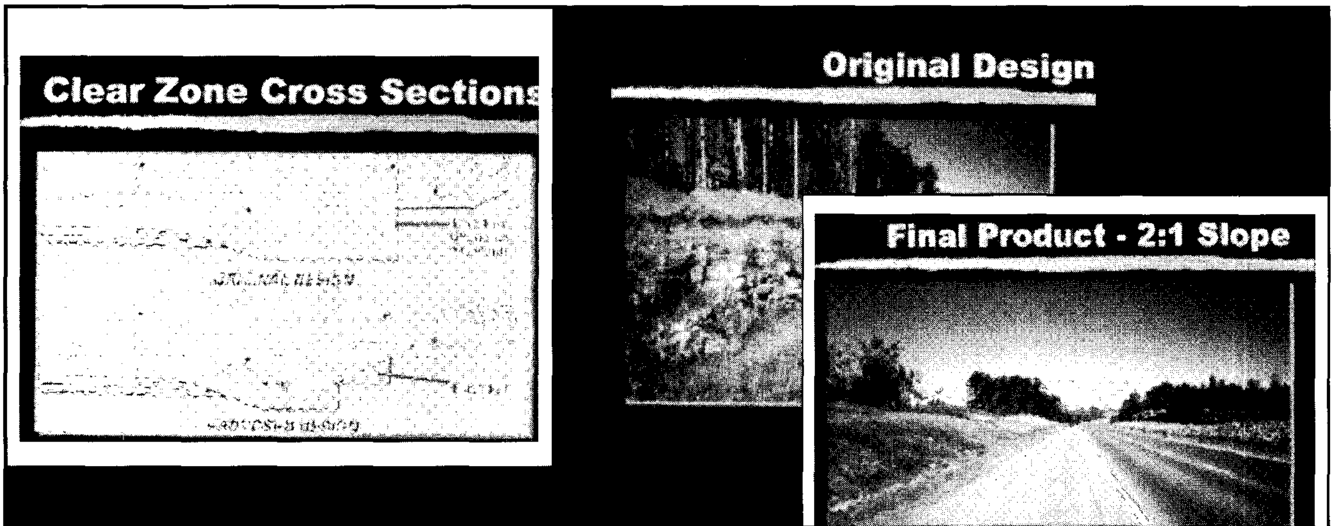
CASE STUDY 1 : SAMOA BRIDGES SEISMIC GATE



This "seismic gate" was an alternative developed for a bridge seismic upgrade Caltrans project within an estuary of the Pacific Ocean in Northern California. The project was statutorily required to provide seismic upgrades to a required level of safety by a specific date.

The gate is activated by a seismic event detected by a seismograph connected to a control mechanism. This feature allowed the delivery of the final contract documents to be delayed in exchange for improvements and refinements in design data and analysis. Specifically geotechnical data and the associated seismic forces were significantly reduced as a result of this calculated delay. This refinement in the design reduced the construction costs of the project reduction from $61 million to $34 million.

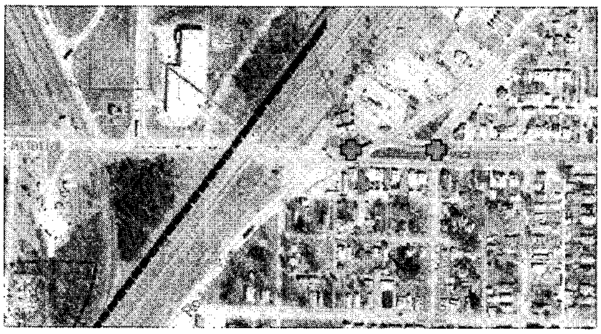
CASE STUDY 2 : ROCK CUT PROTECTED BY EMBANKMENT



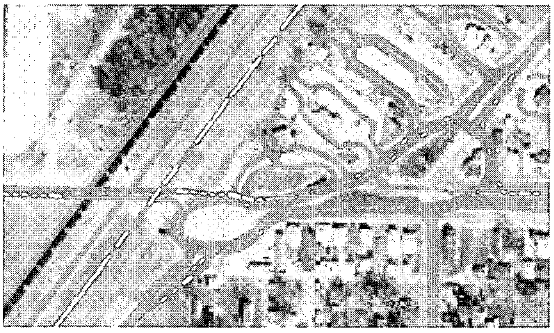
This alternative was a value engineering change proposal (VECP) on Highway 416 in the Province of Ontario, Canada. The original contract documents provided for a 10 meter clearzone stipulated by the Ministry of Transportation of Ontario (MTO). This standard accepts that statistically twenty percent of the errant vehicles can be expected to collide with the rock face. The VECP proposed two benched-rock cuts with overlaid with earthfill to eliminate the collisions with the rock face.

CASE STUDY 3 : PEANABOUT INTERSECTION

MoDOT Improvement Project Offset Intersection & Train Crossing Existing Conditions



MoDOT Module I VA Alternative "Peanabout"



This alternative developed for the Missouri Department of Transportation during a VE training event suggests a roundabout in the shape of a peanut as a solution to two closely spaced traditional stop-control intersections. The accident at the intersection locations was 40 times the statewide average. It should be noted that two-closely spaced round roundabouts failed operationally due to overlapping storage.

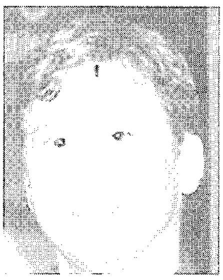
The "peanabout" operates within the requirements of a modern roundabout as follows:

- Low speed requirement to allow gaps for entry vehicles
- Low speed normally requires a small diameter, peanabout also has low speed requirement due to its deflections.
- Storage within intersection

Furthermore, the peanabout solution afforded the following advantages:

- Joins one intersection into two.
- Allows business access to the intersection & roadway

AUTHORS' BIOGRAPHY



Global Management Systems, Owner

George provides value management services encompassing value studies, training courses and value program guidance for the public works sector. He previously managed the Value Analysis (VA) Program for California Department of Transportation, a program providing improvements in quality, performance and costs on projects and processes for nine years.

He has recently assisted and established value management programs for governments and agencies in Latin American, Asia and Europe. Furthermore, he is advocate of integrating project management techniques with established value analysis techniques, particularly as they relate to the public work sector. He is a registered civil engineer with over 20 years of experience in the transportation and mining sector and certified value specialist