VE'S APPLICATION IN REDUCING TOTAL OWNERSHIP COSTS WITHIN THE ARMY

Andrew Lee
Steven Gunther
US Army Communications Electronics Command

Andrew Lee is the team leader in charge of the Value Engineering Program within the Value Concepts Office (VCO) at the US Army Communications Electronics Command (CECOM), Fort Monmouth, NJ. Mr. Lee received his Bachelor of Science degree in Mechanical and Aerospace Engineering from Rutgers University, College of Engineering, of New Jersey. Mr. Lee has been working with the CECOM VE Program for the past four years and his main responsibilities include working with the CECOM Integrated Product Teams (IPT) and the Program Managers to identify viable VE projects, setting up VE workshops, reviewing Value Engineering Change Proposals (contractor submitted) and Value Engineering Proposals (government initiated), tracking VE savings, developing local VE policy and guidance, and briefing CECOM upper management and major contractors to promote the VE program.

Steve Gunther is involved with identifying and evaluating Total Ownership Cost Reduction Projects at the US Army Communications Electronics Command (CECOM), Fort Monmouth, NJ. Mr. Gunther received his Bachelor of Science degree in Industrial Engineering from Rutgers University, College of Engineering, New Jersey. Mr. Gunther was previously the standardization team leader and was involved in the specification and standards acquisition reform efforts of CECOM. Mr. Gunther has published numerous performance specifications utilized within CECOM acquisitions. Mr. Gunther was also an engineer within the Army Research Laboratory where his involvement was in the areas of batteries and passive components.

ABSTRACT

This paper will demonstrate how the value engineering methodology can be applied throughout the equipment life cycle within the Department of the Army. Examples and results of Value Methodology Workshops will be used. These workshops are focused on specific equipment and their application to the war fighter.

INTRODUCTION

What is Total Ownership Cost (TOC)? According to Dr. Jacques S. Gansler, Under Secretary of Defense for Acquisition and Technology, Department of Defense (DoD) TOC is the sum of all financial resources necessary to organize, equip, train, sustain, and operate military forces sufficient to meet national goals in compliance with all laws, all policies applicable to DoD, all standards in effect for readiness, safety, and quality of life, and all other official measures of performance for DoD and its components. DoD TOC is comprised of costs to research, develop, acquire, own, operate, and dispose of weapons and support systems, other equipment and real property, the costs to recruit, train, retain, separate and otherwise support military and civilian personnel, and all other costs of business operations of the DoD.

Why is reducing TOC so important for DoD and the Army? The DoD is facing the problem of reduced defense budget to procure new systems to replace the old ones. The decreased procurement funds have resulted in older systems staying in the field longer than expected,

therefore driving up the costs to maintain and support these older systems. The high costs to sustain the older systems further impact the availability of procurement funds to acquire new systems. *Figure 1* shows the TOC breakdown of a typical DoD System. The Operations and Logistics Support Costs account for a whopping 72% of the TOC. When these systems are forced to stay in service longer due to decreased procurement funds, the percentage of Operations and Logistics Support Costs is likely to increase even more, further reduce the availability of procurement funds. The result is (some would refer to as) the "DoD's Death Spiral" (see *Figure 2*). The DoD will end up with many outdated systems that are very expensive to operate, maintain and support. These older systems will severely impact the READINESS and take away the technological edge our armed forces enjoy over the adversary forces. The Army in the 21st Century needs to be responsive and ready for deployment, anywhere in the world, a brigade in 96 hours, a division in 120 hours, and five divisions in 30 days. It will be very difficult to meet these objectives if the TOC is not being controlled.

It is a difficult task to work within today's smaller defense budget without sacrificing performance or reliability and continue to provide the technological edge the soldier needs to defeat the adversary forces. Learning to design in affordability, achieving control over future costs of new systems, and effectively reducing the cost of current systems is one of the most important considerations in today's DoD acquisition effort. This applies to the smallest spares procurement as well as the development of major systems.

DISCUSSION

The DoD describes the life of systems by phases. These phases are:

Phase 0: Concept Exploration- Define and evaluate the feasibility of alternative concepts and to assess the relative merits of each.

Phase I: Program Definition and Risk Reduction- Prototypes and demonstrations as well as life cycle cost estimates are considered.

Phase II: Engineering and Manufacturing Development- Translate the most promising design approach into a stable, interoperable, producible, supportable, and cost effective design.

Phase III: Production, Fielding/ Deployment, and Operational Support- Achieve an operational capability that satisfies mission needs. Execute a program that supports all the performance requirements and sustain the life cycle cost in the most effective manner. At the end of its useful life, a system must be demilitarized and disposed.

How can the value engineering methodology be used at different life cycle phases to reduce TOC? Here at the Communications- Electronics Command (CECOM), Program Executive Office for Intelligence, Electronic Warfare and Sensors (PEO IEW&S) and the Program Executive Office for Command, Control, and Communications Systems (PEO C3S), we have successfully applied the value methodology throughout the acquisition life cycle phases to reduce total ownership costs. In this paper, one example of effectively applying VE to reduce TOC will be demonstrated.

The decision process of trying to reduce TOC when acquiring a DoD system is very similar to selecting a new automobile, only in a much bigger scale, both in terms of dollars and number of deciding factors. For example, we decide to buy a new automobile for $20,000. During the course of its useful life, we would then spend an additional $30,000 to operate and support the automobile. These costs would include maintenance, replacement parts, insurance, gasoline, etc. During our decision process when picking out the make and model of the car, do we fully consider the total life cycle costs? Do we estimate our annual mileage, cost of gasoline per mile, repair rates, purchasing of an extended warranty, availability and cost of replacement parts? If we applied the VE methodology and principles when selecting our automobile, we would consider each of these factors along with evaluating the option of leasing the car.

There are many steps involved to effectively reducing TOC for a DoD system. These steps are:

- **Identify Requirement**- This is the starting point to implement a TOC reduction process. The budget constraint must be identified first. What the system must do? How to establish realistic needs and benefits

to the system? How to translate DoD and Army requirements to program or system level? These questions should be answered first before proceeding.

- **Establish an Integrated Process Team (IPT)-** An IPT will be established with core members who are stakeholders, and empowered to make trade- off decisions.

- **Establish Cost and Performance Baseline-** Cost and performance baselines, using currently available (historical data) and projected numbers, will be established to provide a yardstick for measuring progress. The cost baseline will include cost elements (such as testing, procurement, replenishment spares, operations, maintenance, sustaining support, training, etc.) that will allow us to search for cost drivers.

- **Identify & Analyze Cost Drivers-** Every part of a system costs something and the IPT will need to focus on the problem areas where IPT can exercise influence. The IPT will need to first identify any component, process, or other aspect of a system that exerts a disproportionate influence on TOC. After identifying a list of cost drivers, the IPT will need to screen them using a set of established screening criteria to refine the list. Some of the screening criteria, or constraints, that can influence TOC include User Requirements, Acquisition Strategy, Production Considerations, and Support Concepts. The objective to screen cost drivers is to produce a final list of cost drivers that the IPT can effectively reduce TOC with the highest potential return on investment (ROI).

- **Set Goals-** Setting goals (how much do we want to save?) will help the responsible IPT to focus and better plan their TOC reduction efforts.

- **Identify Tools and Initiatives-** The IPT will need to identify methods or approaches that can be used to reduce TOC. There are many TOC reduction tools and initiatives with redesign money available that the IPT can use. The IPT must evaluate each situation separately, understand the cost driver, consider the benefits/ risks of tools used, consider the life cycle phase impacted, and consider any associated external constraints.

- **Evaluate & Prioritize-** After making the determination on what tools and techniques will be used, alternative cost reduction strategies will be developed. Each alternative cost reduction strategy will include different mixes of recommended tools and initiatives. To increase the chance of achieve success, it makes sense to build more than one alternative strategy. Evaluate each strategy against performance, savings, and risk (technical, schedule, cost, and supportability).

- **Implementation-** After selecting the best cost- reduction strategy, the IPT should develop an implementation plan that will identify all the administrative data (such as program or system name, summary, TOC reduction goal/ objectives, approval signature(s)), new cost profile, source of investment funds, assumptions, cost methodologies, risk assessment, operational impact, and schedule impact.

The process to reduce TOC is very resource demanding and time consuming. Most of the DoD program/ system managers have very limited personnel resources, and in many cases, a very tight production and equipment fielding schedules. Trying to do more with less to meet the daily demands, and reduce TOC on top of it becomes a challenge. Fortunately, the Value Engineering Methodology, governed by a structured decision-making process, can be adapted to effectively incorporate the TOC reduction process. The proven structured VE process can help the program/system managers save valuable resources and time. The professionally trained Certified Value Specialist (CVS), following the VE Job Plan, can assist the managers to organize a structured approach. The CVS can assist in scheduling pre-event meetings, and identify TOC requirements, identify IPT members, gather necessary information and data to build a TOC baseline, and set TOC reduction goals. The CVS's workshop facilitation skills, the use of the Function Analysis Systems Technique (FAST), and other brainstorming and evaluation tools, can greatly increase the chance to successfully develop the best TOC reduction strategy. The organized VE process can help make a daunting and time- consuming task into a focused effort that can be completed within a

reasonable timeframe. *Figure 3* demonstrates the TOC reduction process utilizing the Value Engineering Methodology Workshop approach. Due to the complexity of some DoD/ Army systems, the typical one- week long workshop may need to be extended to several one- week sessions to successfully complete the TOC reduction task. In any case, the VE structured process is a highly recommended approach to problem solving and very effective management tool because of its proven track record.

VE SUCCESSES IN REDUCING TOC

Although the VE Methodology has been in existence since World War II, using VE Methodology to reduce TOC is a new concept. In CECOM, several program/ system managers have tried this new concept and reaped tremendous benefits for their programs.

One such Program Manager is PM Joint Tactical Terminal/ Common Integrated Broadcast Service Module (JTT/CIBS-M). Over the last two years, PM JTT/CIBS-M has aggressively pursued opportunities to reduce TOC and adapted the VE approach to successfully reduce TOC on their systems.

The JTT/CIBS-M systems provide the joint-service warfighter with near- real - time tactical intelligence and targeting information. The terminals supply the critical data link to battle managers, intelligence centers, air defense, fire support and aviation nodes across all services. The terminals are integrated into other weapon systems and are transported with the host system/ platform. The terminals will be mounted in fix and rotary winged aircrafts, surface ships, and fixed or mobile ground platforms and vehicles.

Two VE Workshops were held so far and one more is scheduled later this year. Through the structured VE approach, the first two workshops generated several proposals that resulted in TOC savings, as well as product and readiness improvements.

The first workshop was conducted during **Phase II- Engineering and Manufacturing Development** of the program life cycle. The JTT Transceiver/ Receiver (T/R) mounting tray was identified as a major TOC cost driver in hardware design prior to the workshop. An IPT that included the PM, the prime contractor, and JTT joint service users was formed to investigate ways to address the mounting tray problem. Using FAST, the IPT was able to identify several value improvements to the mounting tray. To implement the change, the contractor submitted a Value Engineering Change Proposal (VECP) to PM JTT/CIBS-M to incorporate the improvements. The redesigned mounting tray saved over $1 million in TOC. The new tray is more reliable, lighter, has fewer cables, and produces significantly less noise than the older design. The VECP allows the contractor to share the savings with PM JTT/CIBS-M. It was a WIN- WIN- WIN for the PM, Contractor and the equipment users.

A second workshop was scheduled during **Phase III- Production, Fielding/ Deployment** of the program life cycle. This workshop concentrated on Operations and Support cost drivers. Again, the IPT was successful in identifying TOC savings by incorporating an automated frequency standard adjustment in lieu of periodic manual adjustment. The frequency standard, found in the oven controlled crystal oscillator (embedded in JTT), drifts over time. The IPT discovered during the workshop that the embedded GPS receiver in the JTT could be used as a means of re- calibrating the crystal oscillator with the addition of some added circuitry in the JTT. The redesign cost is $700,000. The savings over the 15- year product life is over $4 millions, based on the elimination of efforts and materials required by users, maintainers and trainers to perform regular manual adjustments to the crystal oscillator. Again, a VECP was submitted to implement the redesign.

Without the use of VE, PM JTT/CIBS-M would not have been successful in their endeavor to reduce TOC, without adding personnel resources (adding program costs) and causing schedule delay to the program. Lieutenant Colonel Kostek, Program Manager for the JTT/CIBS-M systems, had this to say about using VE for his program: *"Initially, I was skeptical about committing the personnel resources for a week to support the VE workshop. In hindsight, it was some of the best time spent by this program office and the other service participants - true value- added from a cost savings perspective as well as providing a better quality product to the warfighter. I can't think of a better application of resources to use as early as possible in an acquisition program. I support VE totally, and*

in our case, the return was worth the investment."

SUMMARY

Mr. Paul J. Hoeper, Army Acquisition Executive, recognizes the power and importance of using VE to improve values of DoD/ Army systems. In his memorandum to establish VE Fiscal Year 2000 Saving Goal, he urges the Army acquisition professionals to use the VE workshop approach to identify cost reduction solutions and other value improvement opportunities, and stimulate product improvement activity where there might not be any. He further encourages the Army workforce to develop effective VE plans and workshops.

DoD has an urgent need to reduce TOC and avoid the "death spiral" effect. Failing to control TOC will have a serious impact on the state of readiness of our armed forces. Our mission as the world peace- keepers in the new century will be jeopardized if we can't provide our soldiers the most technologically advanced weapon systems. VE has proven itself as the most effective tool to reduce TOC. At CECOM, over 30 VE Workshops were held to reduce TOC and tremendous savings have been realized as a result. It's important that the entire Army acquisition workforce recognizes the need to reduce TOC and uses VE as THE TOOL to do it.

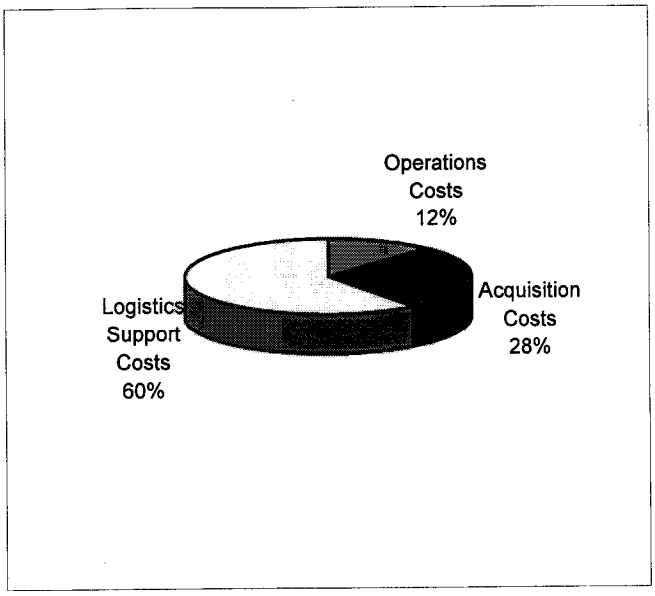

Figure 1: Total Ownership Cost of a Typical DoD

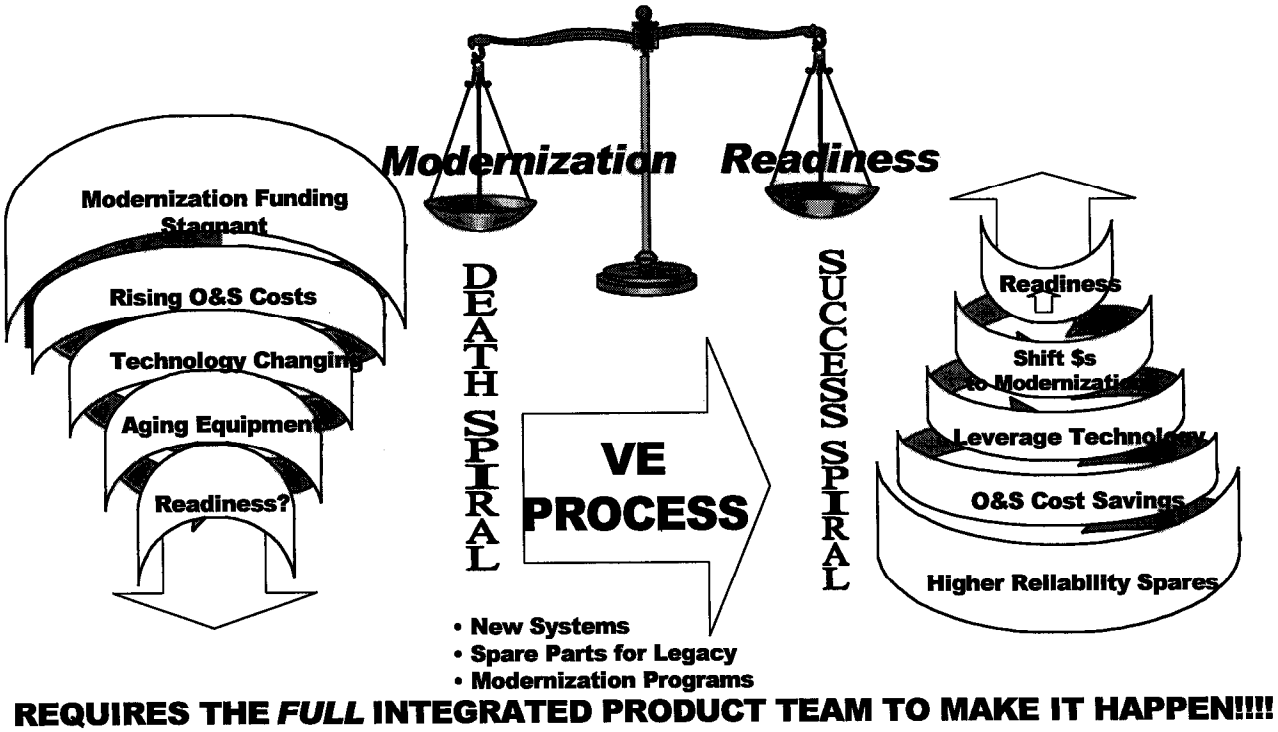

Figure 2: The DoD "Death Spirals"

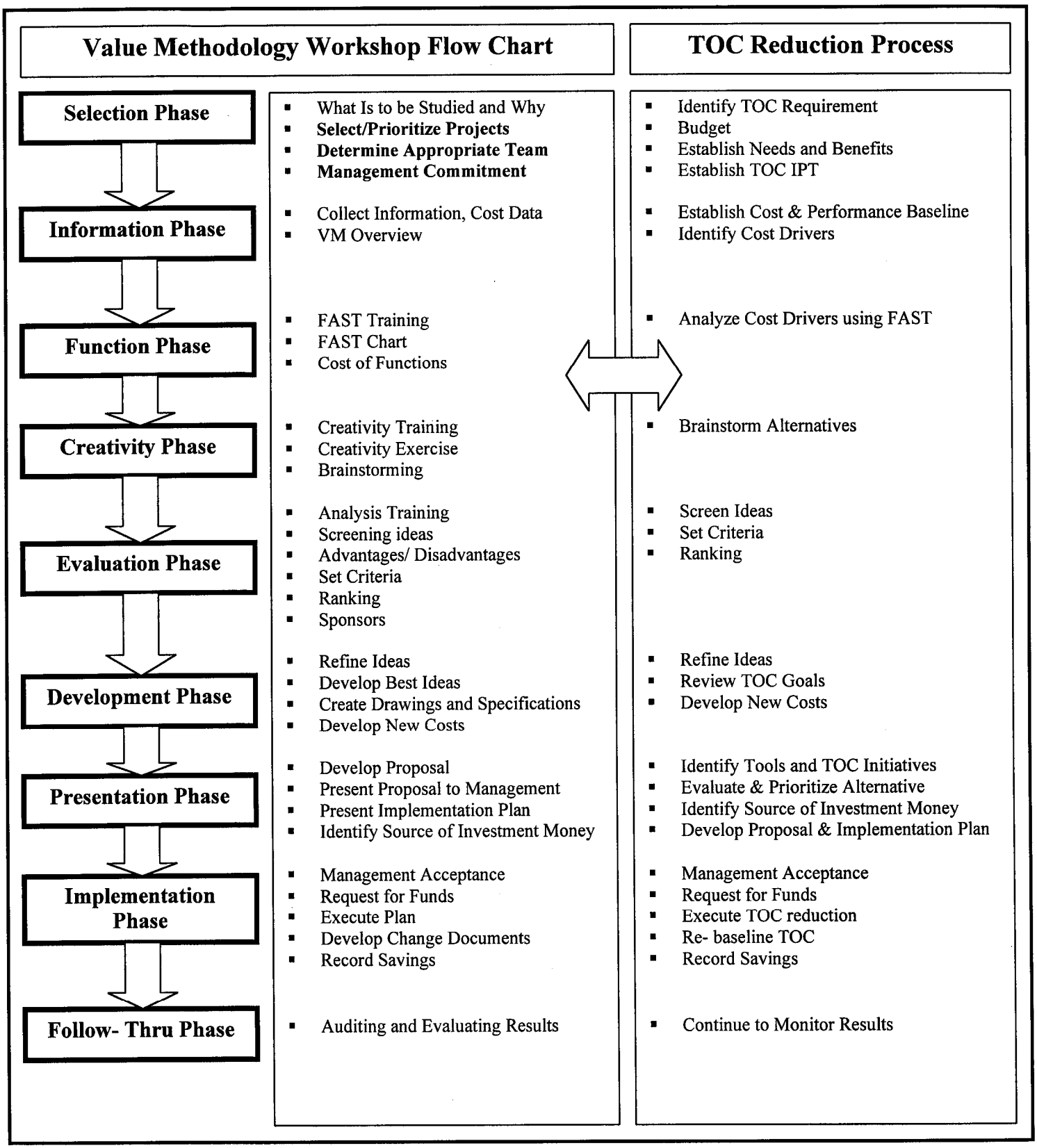

Figure 3: Incorporating Total Ownership Cost Reduction Procss Into Value Engineering Process