

CYIENT

VALUE ENGINEERING: ASSESSING COSTS, QUALITY, AND PERFORMANCE

A systematic and functional approach to improving products

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Abstract

Ideally, products are developed and manufactured using a systematic approach that assesses value for the marketplace. This value is evaluated as a ratio of function to cost. Value increases either by reducing cost or improving the nature of a function—which are client-defined performance requirements. Both of these are based on what will be acceptable by the marketplace. OEMs undergo pressures to improve product quality and function without increasing cost.

In time, the value of products wane due to practical, economic, or stylistic obsolescence. This decline could be attributed to factors like change in conditions, insufficiency of information and ideas, lack of time, and current practices and approaches.

Product owners can address these challenges with Value Engineering (VE)—a professionally applied, function-oriented, systematic team approach used to analyze and improve products, facility designs, systems, or services. This process is a powerful international industry standard for effectively solving problems and reducing costs while enhancing performance and quality requirements. At its core, value engineering uses rational logic, a highly-structured methodology that examines all aspects of design, function, quality, and performance requirements with a goal of enhancing the overall value.

This white paper outlines why it's important for medical technology OEMs to utilize the value engineering process and the challenges firms will face without discovering and implementing VE solutions. The paper also describes the method, the merits of working with an experienced VE partner such as Cyient, and several success stories.

Market pressures lead medtech to search for new value

In the medical device and life science industry, companies are continually challenged due to cost planning for new and emerging markets, supply chain issues, competition, and variables in regional healthcare systems. In order to maintain market relevance, companies must adjust to these hurdles.

Value engineering techniques can yield results in medical product cost reduction, feature adjustments for new products or markets, or quality improvements while retaining the essential features of the core product to prevent the need for regulatory requalification. One way companies can regain control over costs is not only to assess these costs, but also systematically classify and identify them. Additionally, it may be a method for functionally adapting products to different worldwide economies and competition.

The intent of these studies is to produce conclusions that note areas of possible optimization and remove unnecessary expenditures through alternate solutions. Using a systematic approach to perform cost reductions not only yields improvement but provides decision-makers with rationalized trade-offs involved in achieving these efforts.

Risks of not using value engineering

In today's highly competitive marketplace of shrinking product life cycles, value engineering should be recognized as an imperative future investment for growing a product and gaining industry leadership. Employing VE practices does not imply that there was some intent for not having: the best value initially, longer range planning, or improper oversight by the design team—but that the situation has evolved requiring a need to adapt.

VE projects could involve a deep study across multiple departments or a less complex solution like substituting a lower cost but equally functional part. The standard is not a suggestion program and is not a routine project or plan review. In addition, it is not a typical cost reduction program—as it doesn't cheapen the product or simply cut corners.

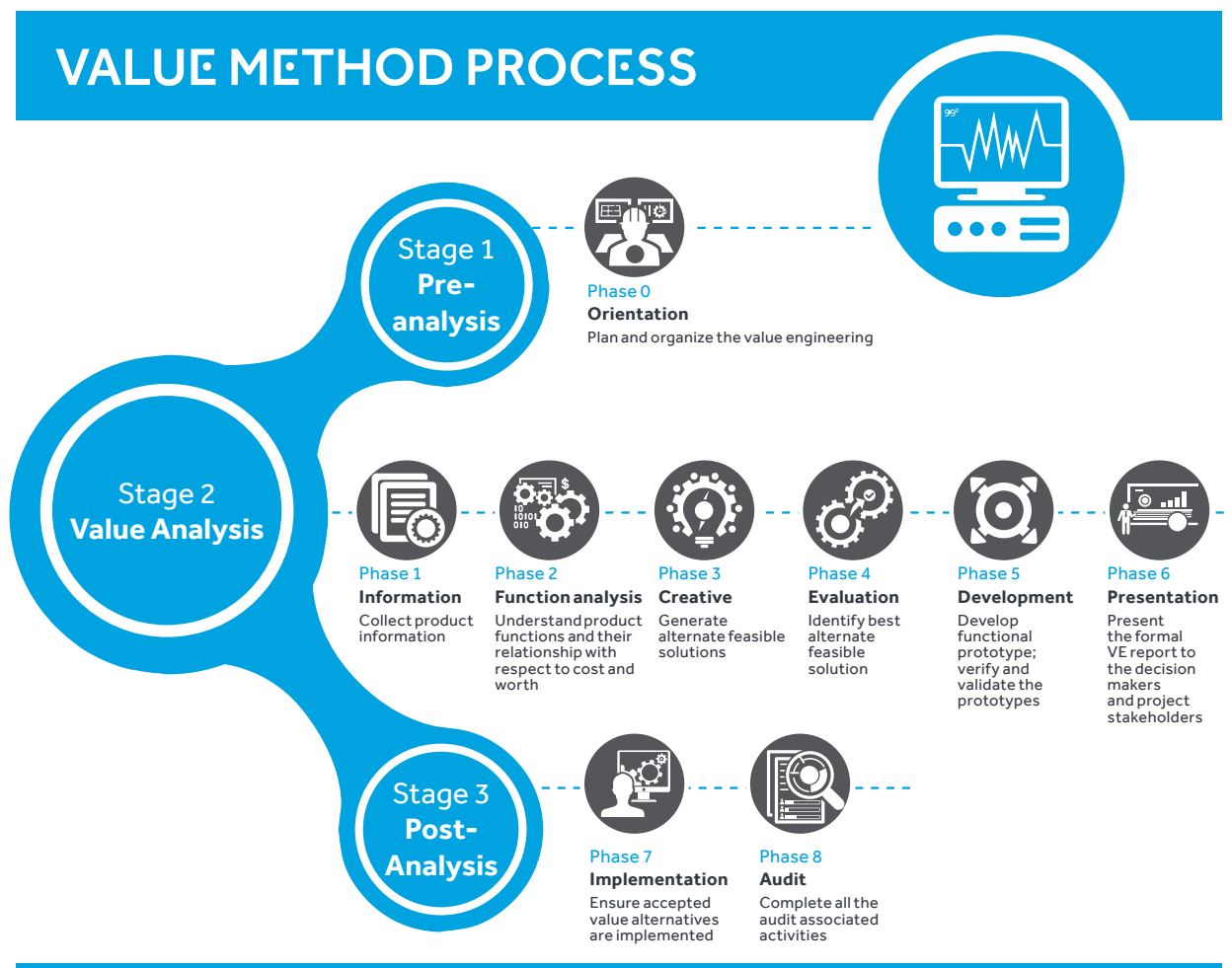
In a dynamic market, if companies fail to recognize the need to implement a value engineering or similar process to their products or organization, they run the risk of losing market relevance and succumbing to the competition. The goal of VE is to extend the life of the product and increase profitability to generate funding that will support development of the next generation product.

Value Method process

At Cyient, we utilize the international value method standard within our quality management system. The process comprises of three primary stages which are further divided into eight phases.

Pre-analysis

The first stage is an orientation phase for the parties involved in the project to develop a clear understanding of current conditions, objectives that need addressing and strategic priorities—along with how refinements are expected to increase organizational value. Project justification and study guidelines are set during this step by establishing goals for benchmark alternatives and an agenda for innovation.



A multidisciplinary stakeholder action team organized between the VE company and the client usually consists of representatives from design, manufacturing and test engineering, purchasing, materials, product management, quality control, support engineering, and field service. Synergy between the department stakeholders is essential for awareness of inter-dependencies of function and quality. Through subsequent stages and underlying phases, the project leader closely monitors and assesses project goals and expected return on investment.

Value analysis

Stage two has six phases. The initial steps (phase 1 and 2) involve collection of relevant information for developing a deeper understanding around the current state of product functions, constraints, cost drivers and market cost environment. Further review and analysis of product functions by the team determines which of them need elimination, substitution, improvement, and creative development to reach the project's goals.

In some cases, certain department members are viewing product processes for the first time to give a different perspective. Part of this analysis involves identifying better ways to perform certain functions.

The formal process of evaluating costs involves:

- Isolating the product into functions (or value-pairs)
- Brainstorming solutions that satisfy functions
- Evaluating total cost and benefits for each proposed change
- Creating action plans to implement the solutions that have net benefit.

Since the relationship of functions and costs are better understood at this point, idea generation should unfold easily. During phases 3 and 4, multiple solutions are generated and assessed for best options. These solutions involve designing for cost efficiencies and use of different materials—among other concepts.

Information and Pre-concepting	Function Analysis and Creative	Detail Designing and Evaluation	Prototyping and Other Development	Presentation and Supporting Launch
<ul style="list-style-type: none"> Market research Benchmarking studies Voice of customer Tear down analysis Regulatory compliance studies 	<ul style="list-style-type: none"> Ideation Re-engineering Retrofitting Design baselining 	<ul style="list-style-type: none"> Manufacturing drawing Modeling Design validation Design and cost optimization Tolerance stack-up studies Motion analysis 	<ul style="list-style-type: none"> Ordering parts Vendor interaction Expediting manufacturing Prototyping support Physical testing support Design optimization 	<ul style="list-style-type: none"> Pilot build support Customer education session Manufacturing engineering support Product realization support

Fig. 1 | Tasks employed during the value engineering analysis follow the typical spectrum of the product management life cycle, leading to solutions which will improve product functions and value.

In the final phases of this stage, the best solutions are determined through verification and validation—in some cases prototypes are produced for this assessment. Later, a value engineering report is generated to provide the client a complete summary of the functional analysis including all documentation and proposed alternatives. This final report is presented to the stakeholders and decision-makers.

The final analysis will distinguish solutions which fall into these areas:

- Redesigning
- Decreasing existing component costs (BOM analysis)
- Substituting components using similar, lesser, or possibly greater parts
- Resourcing and outsourcing
- And/or de-featuring

The proposed value engineering solutions will fall into the following categories:

- Design, cost, and material optimization
- Feature enhancement
- Alternate design and materials
- Variant reduction
- Performance improvement
- Alternate manufacturing process
- Weight reduction

Post-analysis

In this stage, the team ensures the solutions approved by decision makers are properly implemented and have provided value and functional improvement. This is finalized through an audit managed by the same VE partner. Solution implementation follows the organization's product development process.

Engaging a VE partner

OEMs, with their limited internal engineering resources, may choose to partner with a company that has established VE experience. An external organization provides a fresh perspective to question long-held internal beliefs, drive new innovation, and eliminate lost productivity by keeping your team focused on their primary responsibilities. Cyient's range of experience in value engineering programs and variable staffing structure allows for a broad variety of VE projects, resulting in new cost savings and optimizing of products in a collaborative effort with lower risk. This is also expected to bring improved quality management, possible market share expansion, time savings, and resource efficiencies. In addition, the Cyient team understands medtech regulatory and quality processes.

During each project's pre-concept or proposal phase, we target cost reductions in the range of 15%-25% at system level. In addition, our experts can enhance value and lower costs and risks through:

- Multidisciplinary standard procedures and frameworks based on past medtech OEM projects
- More than 75 VE-certified specialists across major industries to analyze productivity and functional savings without compromising performance
- In-house manufacturing and sourcing capabilities and global service and supply network for capitalizing on low-cost country advantages

Success Stories

Case Study 1

Design optimization and cost reduction for a leading automatic endoscope re-processor



Overview

A leading medical equipment manufacturer wanted to reduce the overall product cost by modifying the design without affecting the regulatory status.

Challenges

- Adhering to regulatory constraints while modifying the design
- Gathering manufacturing cost data from different geographies

Our Solution

- Collected information and carried out bug and function analysis

- Created and evaluated various concepts and provided recommendations
- Optimized design, BOM, models, and drawings
- Carried out supplier identification and assessment and unit and system testing
- Developed prototypes for proposed concepts
- Updated the design history file (DHF) and device master record (DMR)

Benefits

Targeted more than 900 functional components, generated over 100 concepts, and completed 25 change request enhancements to improve overall features and reduce product cost by 23%

Case Study 2

Cost reduction support for a leading dental healthcare product



Overview

A leading healthcare technology company wanted to evaluate cost reduction opportunities without affecting the current manufacturing process, function, and design.

Challenges

- Identifying cost reduction opportunities without affecting the current manufacturing process, function, and design
- Adhering to no design change request as the product—being a core revenue generator for the client—cannot have design modifications that may risk their business

Our Solution

- Utilizing a Six Sigma process within the value engineering method, the team completed sub-assembly design changes

Benefits

Helped the client achieve a \$2 million annualized material savings and \$1.5 million yearly savings in manufacturing process

Case Study 3

Enabling functional enhancements and product cost reduction for a leading portable dialysis RO device



Overview

A reputable medical equipment manufacturer wished to reduce the overall cost of the product, make functional enhancements, and ensure the design changes comply with regulatory requirements.

Challenges

- Designing changes under regulatory constraints
- Gathering manufacturing cost data from different geographies
- Ensuring the changes are reverse compatible
- Achieving ROI within 2 years and a minimum of 5% individual part cost savings

Our Solution

- Collected information and carried out functional analysis, created and evaluated various concepts and provided recommendations
- Optimized design, BOM, models, and drawings
- Carried out supplier identification and assessment
- Developed prototypes
- Completed unit testing
- Updated the design history file (DHF) and device master record (DMR)

Benefits

Targeted 150 components, generated more than 35 concepts. Implemented over 20 change enhancements, resulting in an overall product manufacturing cost reduction by 20%

Conclusion

The techniques in this overview ultimately can yield results through a short-term systematic study using certified variants of the Value Method and solutions employed through VE. Opportunities will always exist to discover and improve the value of products and organizations. The competitive and dynamic medtech marketplace—particularly in different geographies and healthcare systems—makes value engineering an important strategy to tackle cost, enhance resource efficiency, and improve quality using a functional analysis. The functional study and cost mapping during VE projects will bring the organization to the root of value improvements.

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Authors

Kuldeep Tyagi is Deputy General Manager of Cyient's medical unit. He has deep experience in product development, system value engineering, and innovative technology development projects in the medical industry. He has expertise in diagnostic imaging, hospital equipment, orthopedic, cardiovascular, and In-vitro-diagnostics medical segments.

Avinash Bhardwaj is Technical Lead in Cyient's medical unit. He is a mechanical engineer with a master's degree in product design and management. He has strong expertise in design engineering, product design and development, value engineering, and risk management. He has led multiple product design and development and value engineering projects in various medical segments including the automatic endoscope re-processor, medical RO systems, and orthopedics.

Note: Due to client confidentiality, images shown are not actual products discussed and for illustrative purposes only.

About Cyient

Cyient is a global provider of engineering, manufacturing, data analytics, networks and operations solutions. We collaborate with our clients to achieve more and shape a better tomorrow.

With decades of experience, Cyient is well positioned to solve problems. Our solutions include product development and life cycle support, process and network engineering, and data transformation and analytics. We provide expertise in the aerospace, consumer, energy, medical, oil and gas, mining, heavy equipment, semiconductor, rail transportation, telecom and utilities industries.

Strong capabilities combined with a network of more than 13,500 associates across 38 global locations enable us to deliver measurable and substantial benefits to major organizations worldwide.

For more information about Cyient, visit our website.

Contact Us

NAM Headquarters

Cyient, Inc.
330 Roberts Street, Suite 400
East Hartford, CT 06108
USA
T: +1 860 528 5430
F: +1 860 528 5873

EMEA Headquarters

Cyient Europe Ltd.
High Holborn House
52-54 High Holborn
London WC1V 6RL
UK
T: +44 20 7404 0640
F: +44 20 7404 0664

APAC Headquarters

Cyient Limited
Level 1, 350 Collins Street
Melbourne, Victoria, 3000
Australia
T: +61 3 8605 4815
F: +61 3 8601 1180

Global Headquarters

Cyient Limited
Plot No. 11
Software Units Layout
Infocity, Madhapur
Hyderabad - 500081
India
T: +91 40 6764 1000
F: +91 40 2311 0352

cyient.com
connect@cyient.com