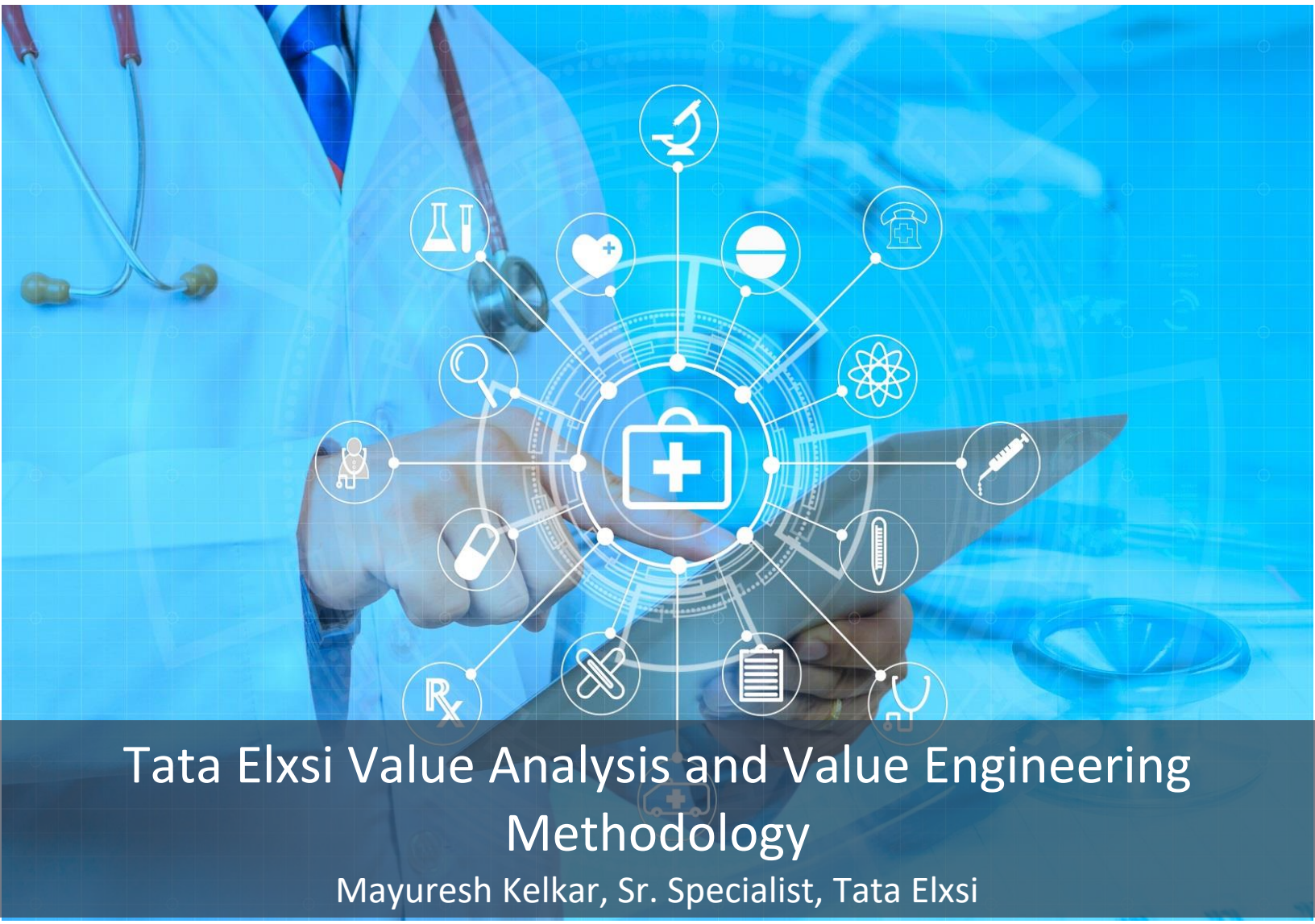

Tata Elxsi Value Analysis and Value Engineering Methodology

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ABSTRACT

The majority of medical device companies would have confronted the circumstance where at least one of their products is not aggressively priced to meet the particular market needs.

In most cases, the Bill of Material (BOM) is the essential driver, since that makes up the single biggest cost component in the product. The need to carry out cost reduction activity for the BOM is picking up pace, given to the competitive landscape, changing market needs, user-centric design challenges, and so forth. One way that organizations can regain control over their expenses is by evaluating and systematically classify and identify product costs.

Value Analysis & Value Engineering (VAVE) methods are systematic and very handy in driving down the product cost while maintaining or improving performance and quality requirements.

Current challenges that both the medical device manufacturers and service providers face are **shorter timelines** for value assessment projects and client's urge to have a **'one-stop solution'** to convert VAVE outcomes to product realization to meet **emerging market trends**. These factors are pushing companies to work on innovative methodologies, solutions, and technologies to help stay strong in the competition.

TEVAVE *(Tata Elxsi Value Analysis and Value Engineering) methodology is one of a kind, well-practiced and implemented in Tata Elxsi projects. This white paper presents one feature of TEVAVE - "Structured BOM cost reduction strategy "to deal with exhaustive and sometimes obstructive product bill of materials*.

INTRODUCTION - TEVAVE

Product Value (in terms of, cost value, esteem value, exchange value, and use-value) and cost optimization are the key drivers of the TEVAVE methodology. TEVAVE is a quick and systematic method, being practiced in Tata Elxsi for over 15 years with successful implementation in numerous medical products like IVD devices, therapeutics devices, point of care devices, monitoring devices and surgical devices.

Tools like Teardown, FAST diagram, FMEA, Function Cost worth analysis, ROI calculations, scheduling, Should costing, etc. do not provide direct avenues to reduce product cost while keeping the device functionality intact. This white paper talks about 'BOM cost reduction strategy'- a key aspect of TEVAVE methodology, used by designers as a quick guide to reduce overall project timeline by ~20%.

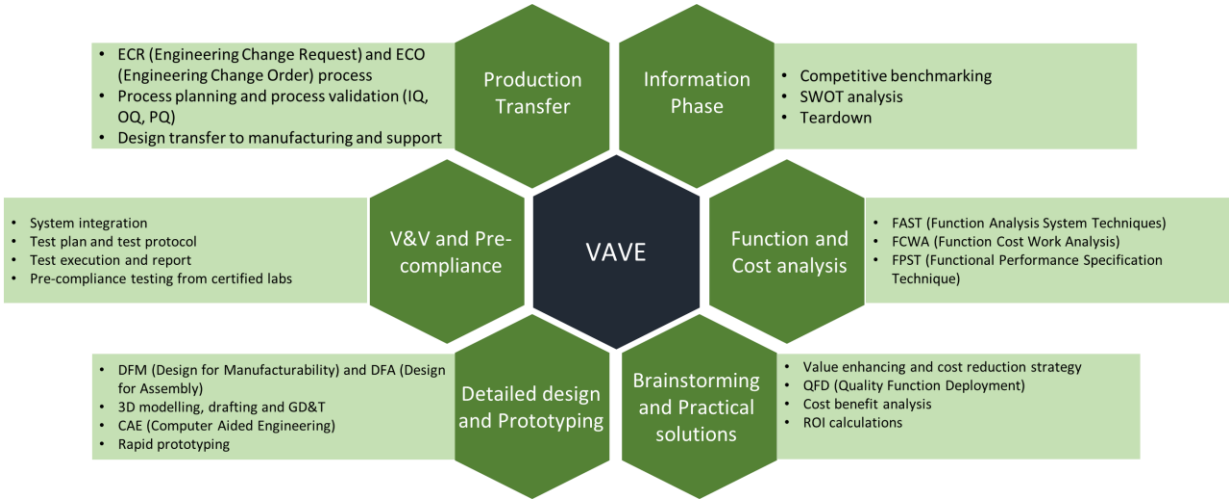


Figure 1: TEVAVE Methodology

THE PROBLEM AREA

Implementation of value engineering tools is mainly done after the information gathering phase & tear down analysis. The designer first needs to understand the device and function of each part with subassembly in detail to create a function block diagram, BOM, etc.

While brainstorming to find practical solutions, designers face difficulty in getting the right start for cost optimization and the methods to be used, like material change, design change or process change. The decision process is time-consuming which generally delays the VAVE projects and affects the VAVE report's holistic approach.

TEVAVE METHODOLOGY

TEVAVE's structured 'BOM cost reduction strategy' gives designers, a start point and a quick guide to work out practical solutions. The three-step approach mentioned here is based on **'cost of adoption**' and '**time to implement changes'.**

- Step 1: Talks about quick techniques like ABC analysis, Boothroyd (a DFM, DFA Tool), etc. which helps to re-understand the product in detail and design a framework, identify parts or subassemblies having maximum impact on the product cost
- Step 2: Shows the directions and ways of initiating cost reduction. Most of the VAVE projects use step 1 and Step 2
- Step 3: Cases where implementation requires considerable time and cost

This methodology renders benefits like reduced project timeline (by ~20%), organized way to maintain the transparency between stakeholders, quick trade-off decisions for ideas to be implemented and helps reduce overall project cost.

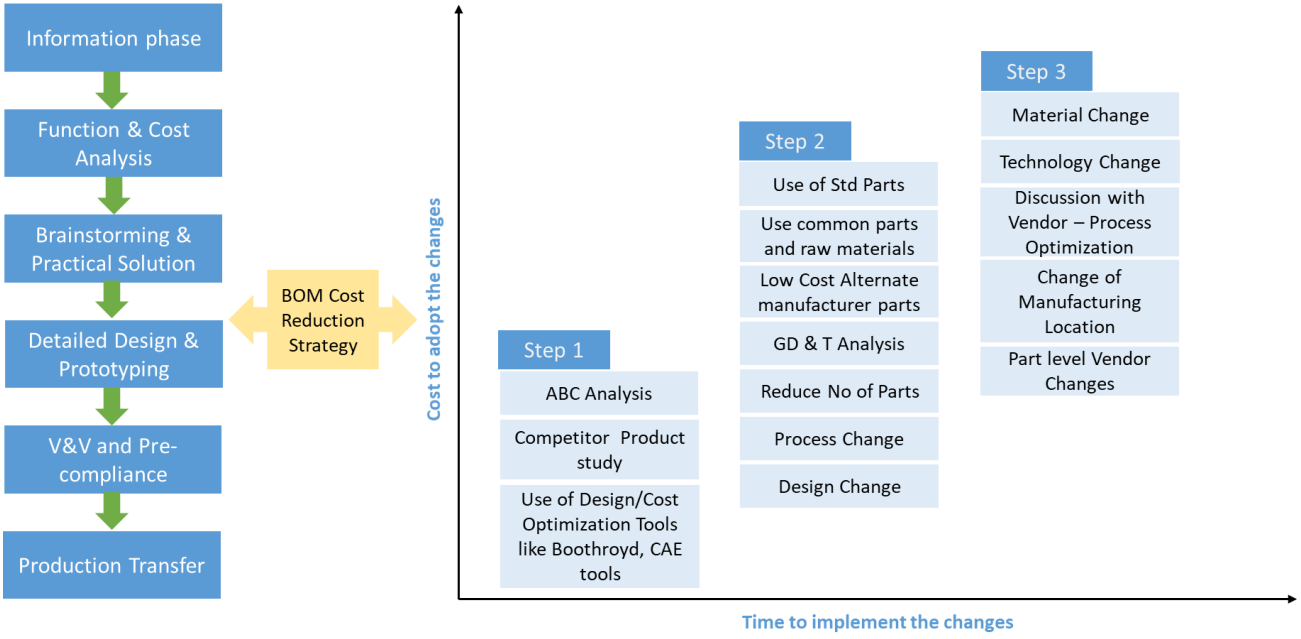


Figure 2: Three-Step approach based on 'cost of adoption' and 'time to implement changes'

TEVAVE - SAMPLE CASE STUDY

A client intended to value engineer single and double electric breast pumps, in order to reduce the cost without changing product aesthetics and thus, wanted to evaluate cost reduction feasibility.

Feasibility study involved knowing the client's product in discussion followed by a thorough competitive analysis of similar products to evaluate the product position in the market followed by BOM cost reduction strategy using TEVAVE methodology.

Step 1: Client Product Analysis

A product study was performed based on all the data provided by the client. Detailed product study on mechanical, electrical and firmware aspects. Block diagrams were plotted to understand the interaction of each component and function.

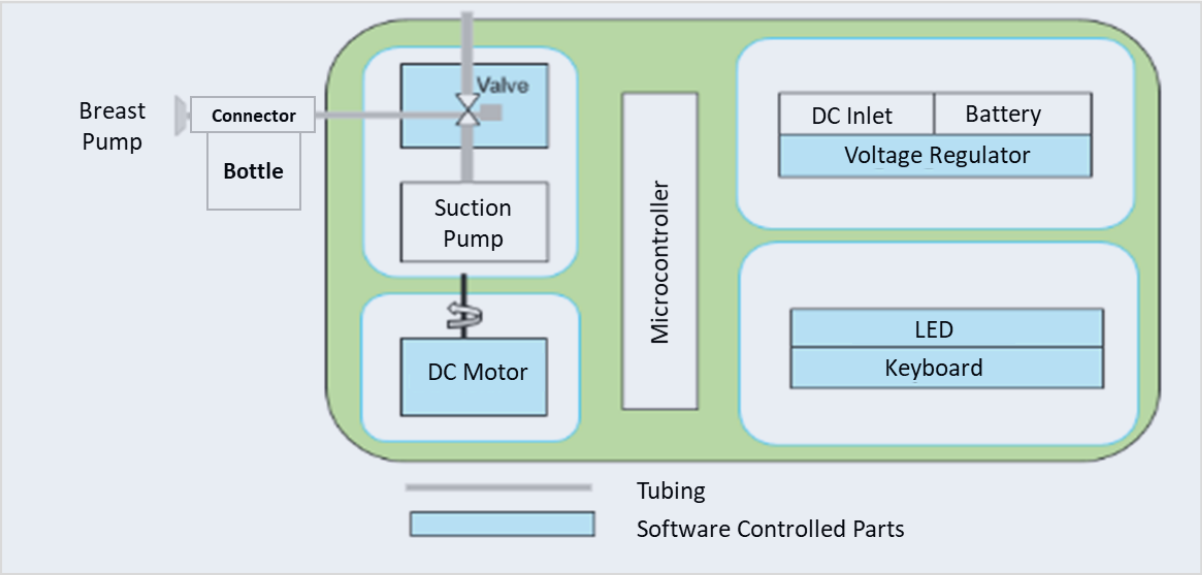


Figure 3: Electric Breast Pump Block Diagram

Step 2: Competitor Product Analysis

Competitor product study, to include physical sample study, web-based product for operator manual, comparison studies, recalls, patents and survey reports, etc. A comparison was performed on the parameters like cost, performance parameters, usability, technology, serviceability, accessories, number of user steps, portability, etc.

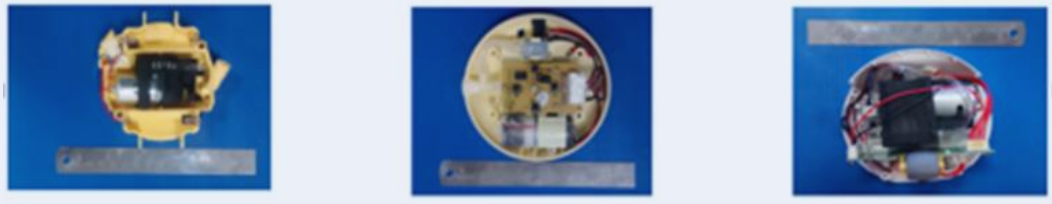
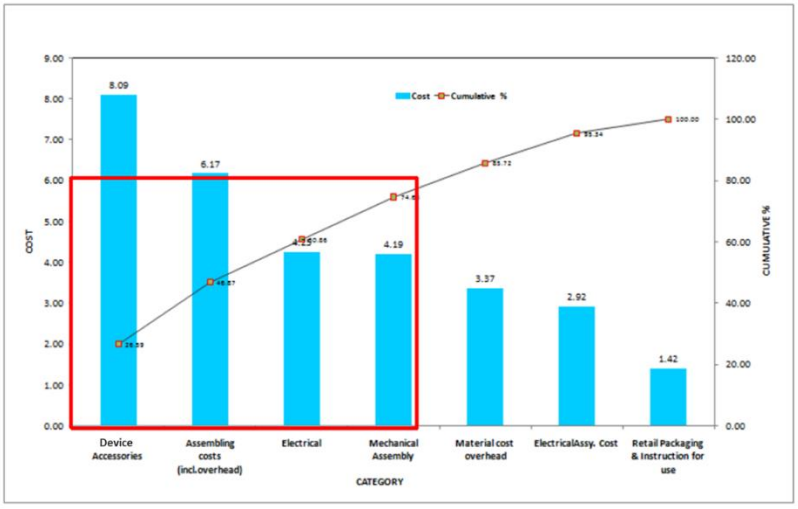


Figure 4: Observation of Different Pump Assembly

BOM Cost Reduction Strategy

BOM was prepared and analyzed as per step 1 of TEVAVE methodology. Parts impacting the BOM on a greater level were identified. As per the initial product study and ABC analysis, areas for cost optimization were recognized. The electrical architecture was weighed to have a better cost optimization outcome than executing changes in the mechanical and firmware counterparts. Concentrated efforts were put in with the help of TEVAVE Step 2 and Step 3, resulting in significant technology changes, thereby improving vacuum control and product cost.



Category	Cumulative %
Device Accessories	26.59
Assembling costs (incl. overhead)	46.87
Electrical	60.86
Mechanical	74.65
Material cost overhead	85.72
Electrical assembly cost	95.34
Retail packaging & Instruction for use	100.00

Figure 5: Device BOM Analysis: Category Level

Challenges/Risks

- Aggressive timeline of 9 weeks
- Maximum possible cost optimization
- Teardown and SWOT analysis of client and competitors products
- Deviation in product performance

Benefits

- Reducing electrical BOM cost by upgrading technology for high level integration through new generation components and modules
- Customized pump to control the vacuum more effectively as per the desired requirements
- Generating high level design specifications and evaluating regulatory impact as per the defined product redesign goals
- Identifying redundant features and evaluating cost effective sub-systems

Value Delivered

- Reduction in electrical BOM cost by 30%
- Target achieved in less than 7 weeks
- Competitive advantage through existing technology
- Regulatory compliant redesign

CONCLUSION

Value Analysis and Value Engineering provides a simple, efficient and quick way to optimize product costs and subsequently grow profits while ensuring the intended product functionality.

*Tata Elxsi has successfully extended the **TEVAVE methodology** across all specialties and domains, such as therapeutic, diagnostic, monitoring, in-vitro devices, etc. to achieve quick turnaround time, devise simplified workflows for initial product assessment, concentrate on the major contributing variables for performance and cost and screen dated technologies. Moreover, TEVAVE helps to identify design insufficiencies, which might be one of the reasons for customer complaints, device malfunctioning, and poor product performance.*

The competitive landscape of the medical device industry requires manufacturers to reduce the product price, enhance technology and provide quality products. The highly methodical and comprehensive nature of TEVAVE provides specific strategies for cost optimization, achieving key constraints like design language, overcoming product footprint and weight constraints, etc., in order to transform abstruse and time consuming VAVE projects into small, achievable and time- bound productive targets.

ABOUT TATA ELXSI

Tata Elxsi is a company that blends technology, creativity, and engineering to help customers transform ideas into world-class products and solutions. Established in 1989, Tata Elxsi offers technology consulting, new product development, product maintenance, migration, testing, and regulatory compliance services to leading product companies, service providers, and niche technology start-ups.

Tata Elxsi has over 15 years of experience in helping companies launch medical imaging, in-vitro diagnostic, patient monitoring, therapeutic, and surgical devices in developed and emerging markets. Its expertise in niche areas such as optics, imaging, mechatronics, industrial design, artificial intelligence, communications, etc. combined with a mature ecosystem of partners makes it a preferred product engineering service partner for leading medical device manufacturers.

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