COSTHOUSE

« Design to Cost »

Overview

> Perfection is achieved, not when there is nothing more to add, but when there is nothing left to take away.
>
> *Antoine de Saint-Exupery*

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- Key concepts
- Implementation
- Case studies and Stories
- Training

Introduction

Design to thrive

✓ From startups and venture capitalists to state funded programs (civil or military), space industry presents major **opportunities** and dreams …

… but also **fierce competition** and major setbacks.

✓ Technical and engineering dimensions still rule …

… but value proposition and **cost effectiveness** now play an equal or higher role.

➥ **Design-to-Cost is essential to all players** looking to survive and thrive …

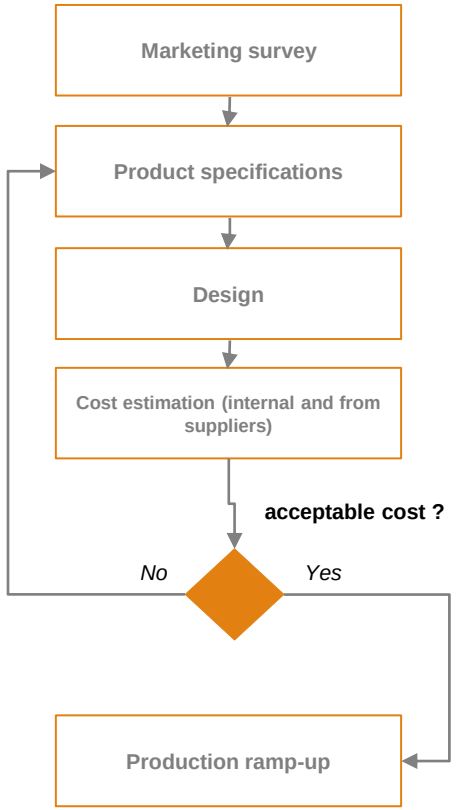
… because **ENGINEERING**, **COST** and stakeholder **VALUE** are equally important

Design To Cost key concepts

A paradigm change in product development process

- "Design to Cost" places voice of customer at the center of product or service development. Implementing D2C reverses common development process : technical solutions are sought to meet market expectations vs setting cost based on technical constraints

Standard development projects



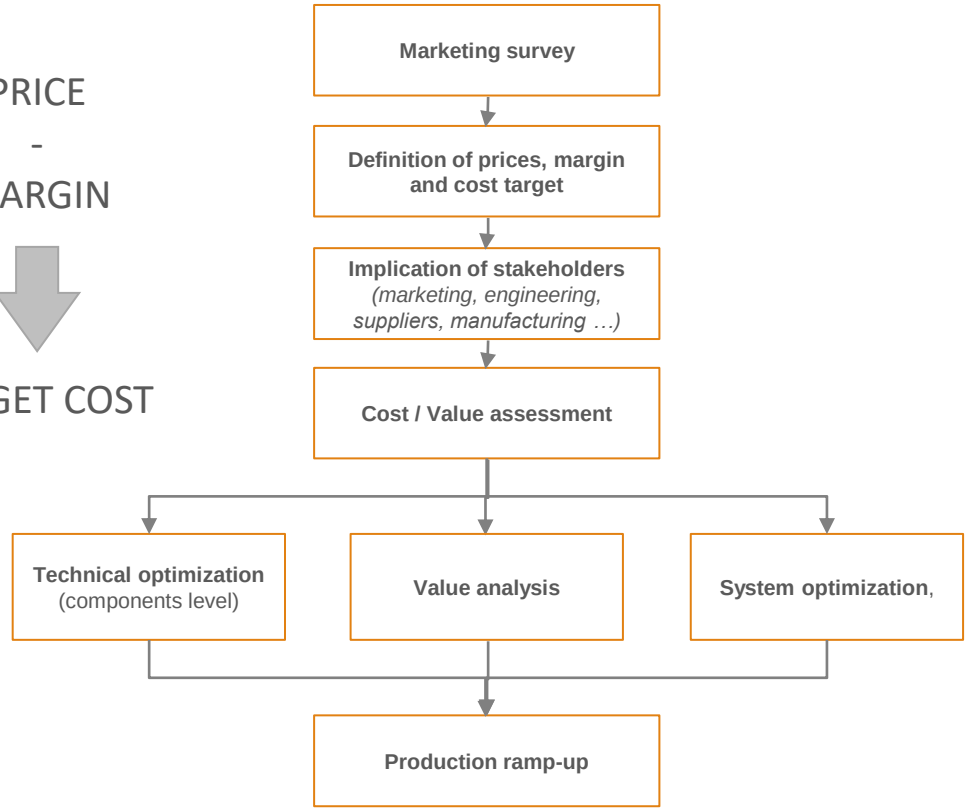
COST
+
MARGIN

PRICE

PRICE
-
MARGIN

TARGET COST

" Design to Cost "



Design To Cost key concepts

Optimization rather than cost killing …

- Competitiveness lies in right balance between cost and value.

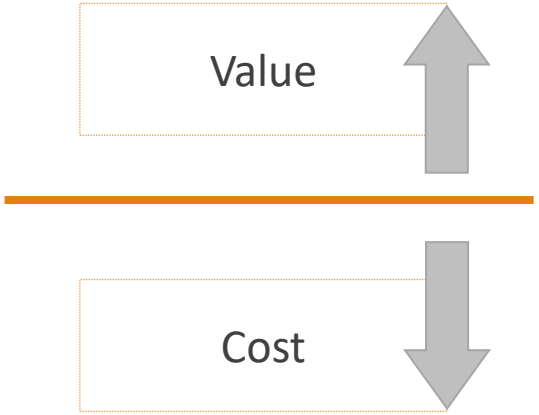
Value

- Functions
- Performance
- Safety
- Brand
- Price
- Differentiators

Cost

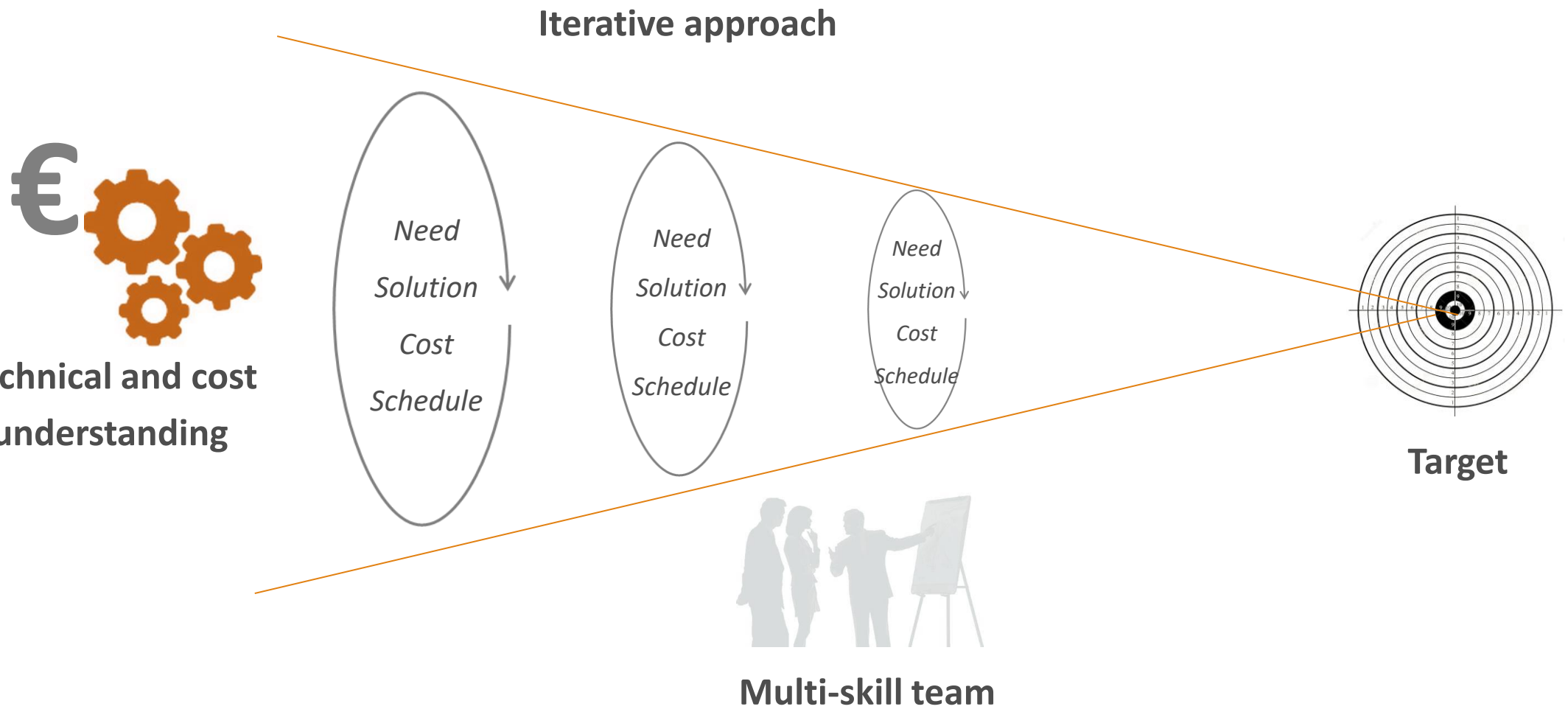
- Direct costs
- Full costs
- TCO (Total Cost of Ownership)
- Recurring Costs / Non-Recurring Costs

- Design To Cost is about finding the right balance between cost and value



Design To Cost key concepts

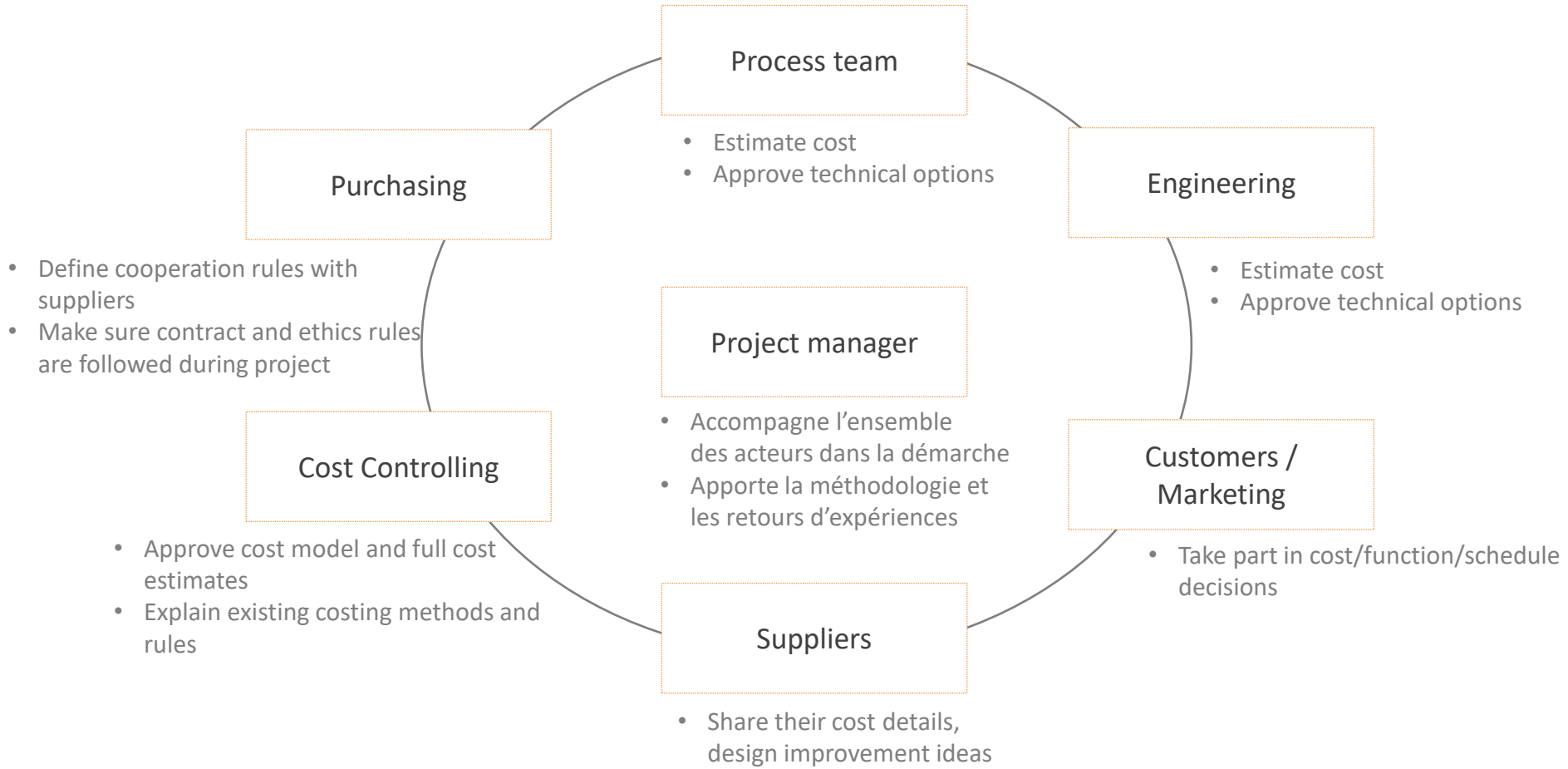
Continuous process involving all actors, at every stage of the project



Design To Cost key concepts

Stakeholders

- To characterize all needs and constraints and to reduce risk, a cross-functional team is recommended :

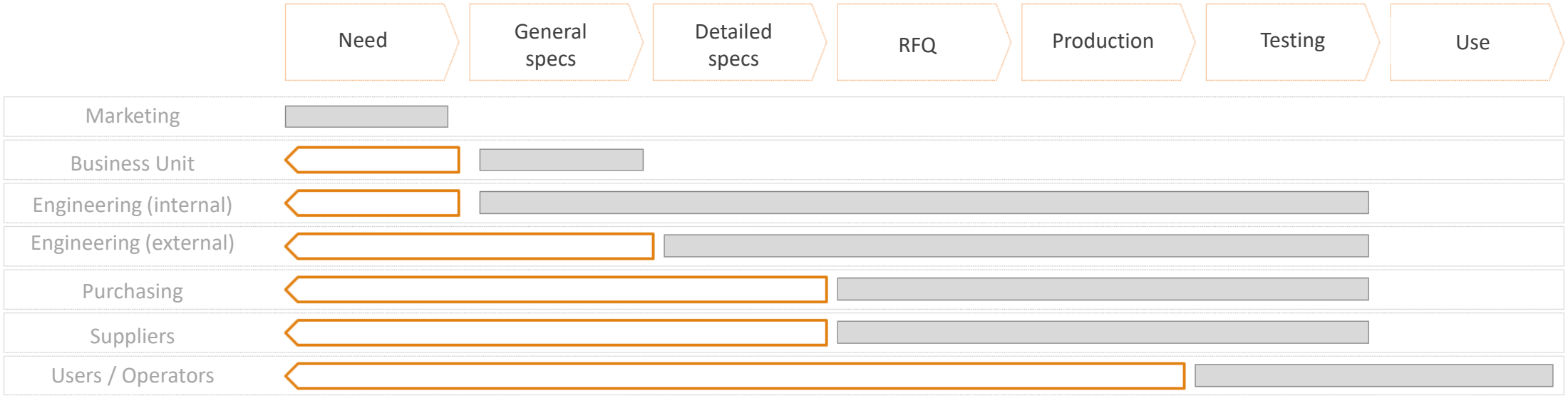


- All stakeholders (including suppliers) must be involved from start.

Design To Cost key concepts

Early involvement

- Classic project management for product/service development only allows to track deviations
- DTC requires early involvement of all stakeholders to define requirements. They remain involved all along to find solutions to match requirements within cost and time perimeters
- Early integration of potential suppliers is key to DTC success



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- Key concepts
- **Implementation**
- Case studies and Stories
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Deployment

steps to success

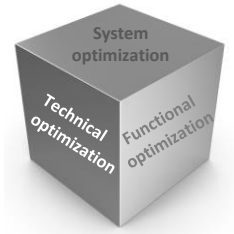
Prerequisites

- Shift design paradigm (cost awareness)
- Build a cross-functional team
- Define cost and design start point

1. Understand cost and cost drivers
2. Challenge cost model if necessary
3. Find cost/value optimized solutions
4. Implement and follow-up

Optimization techniques

Technical optimization



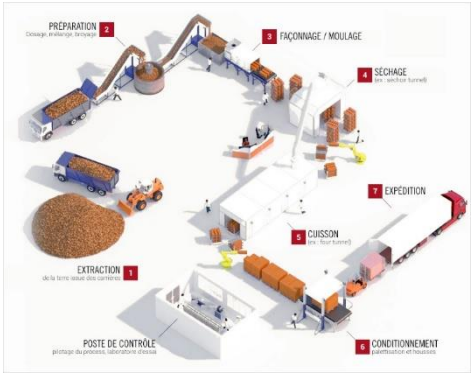
- Technical optimization relies on detailed, line-by-line analysis of components or groups of components …
- … with the goal of understanding main cost drivers, thus:
  - Finding improvement areas with highest potential (material choice, dimensions, process, re-design,…)
  - Finding solutions to optimize cost/performance ratio of a component or sub-assembly
- 2 different methods can be used to estimate cost of components
  - Analytic : based on full breakdown of parts, material and labor
  - Parametric : based on statistics applied to historical data in order to define key cost drivers and associated cost models

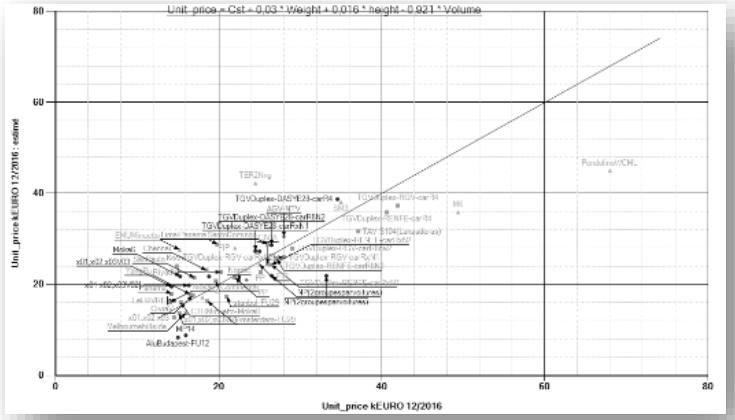
$$Price = F(x, y, z \ldots)$$

x : weight

y : power

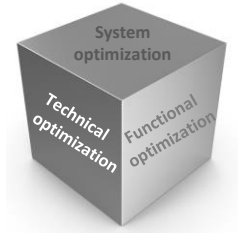
z : country of origin





Optimization techniques

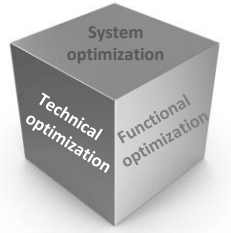
Technical optimization



- Asking and answering the following questions can help to find improvement ideas
  - Product's or service's design
    - What is the component or task used for ? Is it needed ?
    - Can we find similar components or tasks in other products or services (internally or externally) ? What is their cost ? Why is their cost different ?
  - Materials
    - Are these materials and these dimensions standard (internally, for the industry) ?
    - Can we find more standard materials with similar performance ?
    - Is it possible to reduce raw weight (lower scrap, recycling, lower net weight, …) ?
  - Labor
    - What causes need for rework ?
    - Is it worth automating ?
    - Do certain operations require specific skills ?
  - Process
    - Is this technology or process under control/well known in the industry ?
    - Are dimensions compatible with standard tools and processes ?
    - Are tolerances consistent with technologies used or available skills ?

Optimization techniques

Technical optimization



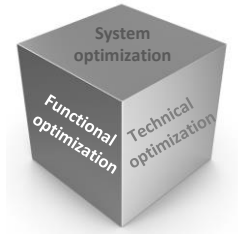
- Cost optimizing solutions depend on the scope and perimeter which are looked at, eg
  - non-recurring vs recurring costs,
  - capital investment vs operations cost

- Typical P&L cost models used to run a company are not meant to embrace the complexity needed for project level decision making.

- This is why specific, more reliable and real-life oriented models should be defined and used.

Optimization techniques

Functional optimization



- Functional optimization aims at challenging existing solutions based on customer needs.

- It relies on 2 key elements
  - Customer need, specified in functions and performance levels (functional analysis)
  - Cost/value ratio analysis (value analysis)

Functional model
- Choice of functions and constraints
- Organization of functions
- Description of functions

Functional cost breakdown
- Cost breakdown of main sub-assemblies (see technical optimization)
- Allocation of sub-assemblies' cost to functions

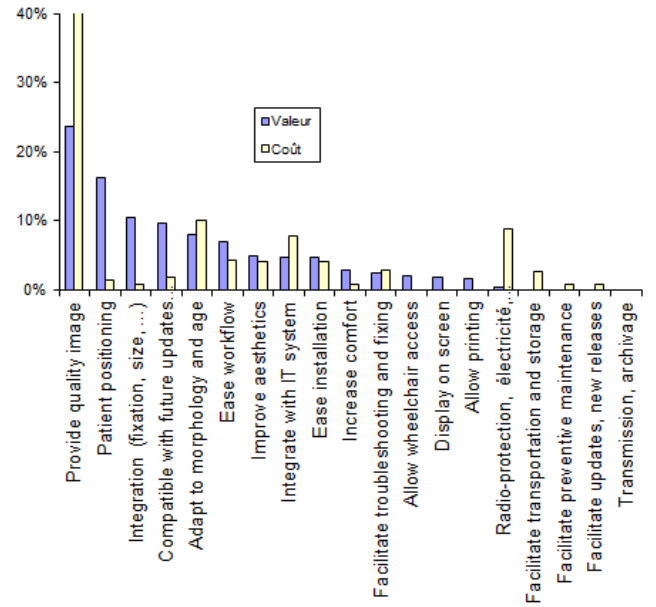
Functions value assessment
- Relative value
- Sales value

Value Analysis
- Comparison of functions' cost and value
- Target cost for each function
- Search for technical solutions within cost target

Customer needs

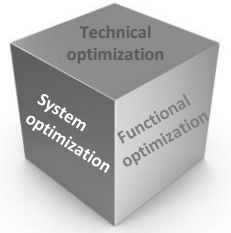
Functional solutions

Technical solutions



Optimization techniques

System optimization

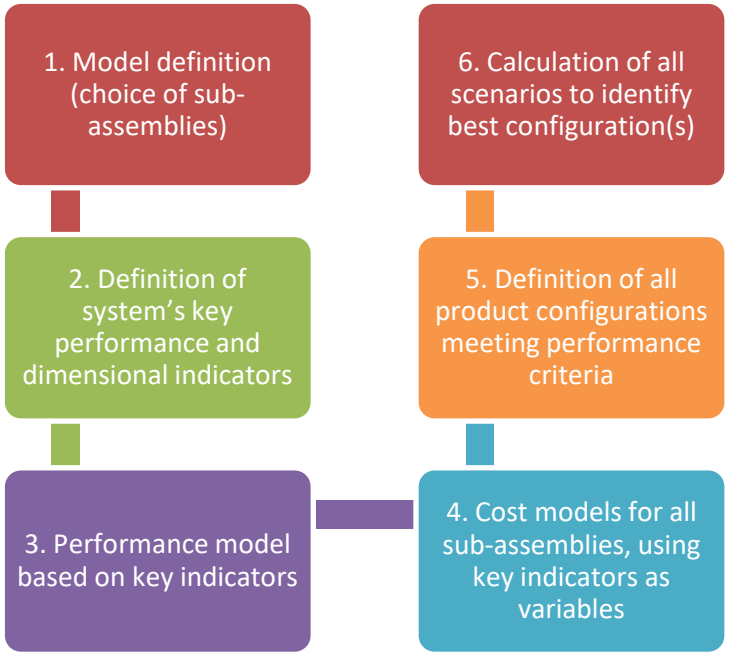


- System optimization is a 3rd technique to find improvement solutions.

- System models, however, are not always possible or worth the efforts. They can be considered:
  - When technical optimization and value analysis did not allow proper level of savings
  - When existing solutions are very constrained or already very simple

- System optimization technique is based on the principle that the sum of local optimums is not always the optimum.

- For system optimization you need to model:
  - Interactions between sub-assemblies
  - Cost behavior of all sub-assemblies



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Paradigm shift in satellite design/value

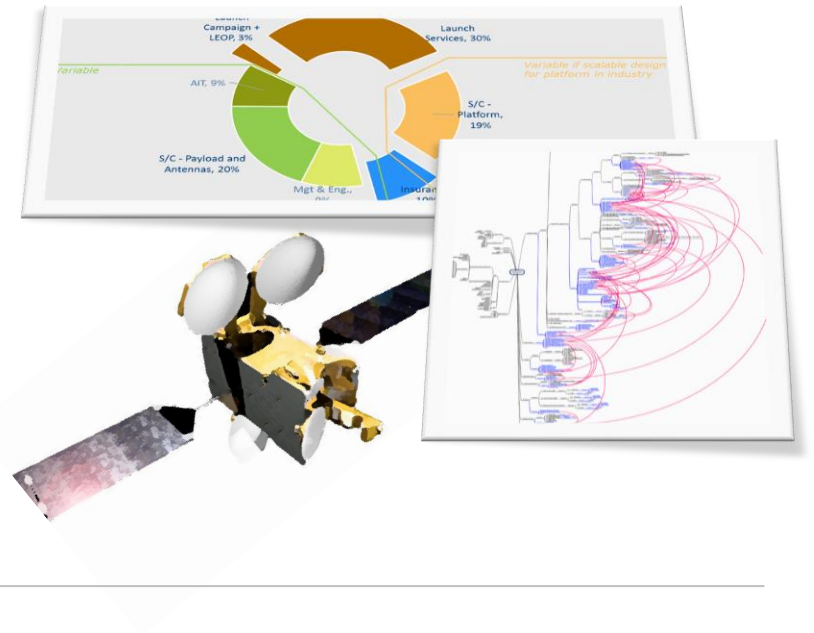
Sell bandwidth instead of transponders

Starting point

- Renewal of satellites requires much higher performance/cost levels
- Technical and environmental environment are much more constrained
- Increased competition from newcomers with alternate technologies

Improvement actions

- Breakdown of complete costs of a program (from design to launch)
- Identification of main cost drivers (project costs, studies, development, manufacturing, components, insurance, launch)
- Review of value / billing model
- Analysis of accessible, fixed/variable, recurring/non-recurring costs
- Modeling of main sub-assemblies' technical and economic dependencies
- Identification of areas for improvement
- Cooperation with industrial partners
- Qualification and ranking of improvement ideas



Results

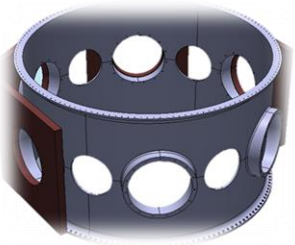
- **New disruptive design leading to substantial cost savings:**
  - service performance instead of technical specifications
  - design for more variable cost of platform and launch
  - paradigm shift in redundancy management
  - optimization of design and engineering time (soft and hard) between recurring and non-recurring

Redesign of microsat dispenser

Challenging cost models to find cost saving ideas

- **Starting point**
  - Complex, multiple interface sub-assembly to combine fastening, launcher structural integrity and swift release mechanism
  - Very low production volume

- **Improvement actions (2 month rush)**
  - Team effort with purchasing, cost estimators, design engineers, manufacturing
  - Cost breakdown at part level (material/purchased parts, labor, assembly, other)
  - Identification of main cost drivers of highest € contributors
  - Quick review of low € parts
  - Performance vs cost estimates
  - Proposal of improvement options



- **Results**
  - **Challenge of hourly rates**
  - **Labor cost optimization (machining)**
  - **Integration of small parts**

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