

The background of the slide is a dark, semi-transparent overlay of a complex data dashboard. It features multiple panels: a large candlestick chart at the top left with price levels from 729000.00 to 733500.00; a central candlestick chart with a lightbulb icon overlaid on it; several smaller charts including a line graph, a bar chart, and three gauge charts showing percentages of 25%, 50%, and 75%. The dashboard includes various UI elements like buttons for 'Compare', 'Indicator', 'Template', 'Snap', and 'Save', as well as data tables and control icons. The overall aesthetic is technical and data-driven.

**EFESO**  
MANAGEMENT CONSULTANTS

# INNOVATING IN FUTURE MOBILITY

Integrated cost management and optimization for profitable e-mobility programs

COST & VALUE ENGINEERING

# INSIGHT

# The global automotive sector is in turmoil: bad news for some but it creates huge opportunities for those who can move fast and stay focused

Global EV-markets offers enormous potential opportunities

Traditional OEMs and suppliers are under intense pressure, thanks to a seismic industry-wide transformation. It's creating enormous stress for established players, now facing a continuous stream of fast-growing challengers from all over the world. Yet the evidence shows that many of those transformations fail. And fast. But it's also clear that many failures could easily be avoided, if the basics of product strategy, development and industrialization were better understood. AND if comprehensive cost management was more rigorously deployed...

The key to achieving healthy margins is to take a comprehensive and granular approach

Healthy potential margins are a key reason for getting involved in EV markets. Yet, many approaches lack in two critical areas:

**Comprehensiveness:** ALL success drivers, such as product, tooling, investment and CO<sub>2</sub>e costs, must be fully addressed in an integrated manner. Since they are all interconnected, there are inevitable penalties involved if there are any trade-offs.

**Granularity:** It's essential to carry out an in-depth analysis on all technologies, processes, assumptions etc. across the entire value chain - high-level benchmarks alone simply do not provide sufficient quality to operationalize decisions.

Only through the combined and detailed understanding of product, tooling, investment and CO<sub>2</sub>e costs, fully adjusted for the respective forecast volumes, can healthy margins be delivered.

The focus of this document is on the product-oriented, design dimension of successful EV operations ('EV launch')

The following 'food-for-thought' observations detail some of the key insights we have acquired while supporting leading players across the automotive industry over the last 25 years – from assisting OEMs to suppliers, established premium and volume players, sports and hypercar specialists, as well as new challengers and start-ups.

Our focus in this document is primarily on Product-Oriented Design as this generally determines the foundations for success.

Today's focus

## Product-oriented design

Trade-offs and optimizations starting from the product but including all relevant aspects in terms of cost (product, tooling, capex, CO<sub>2</sub>e) as well as value-chain assumptions

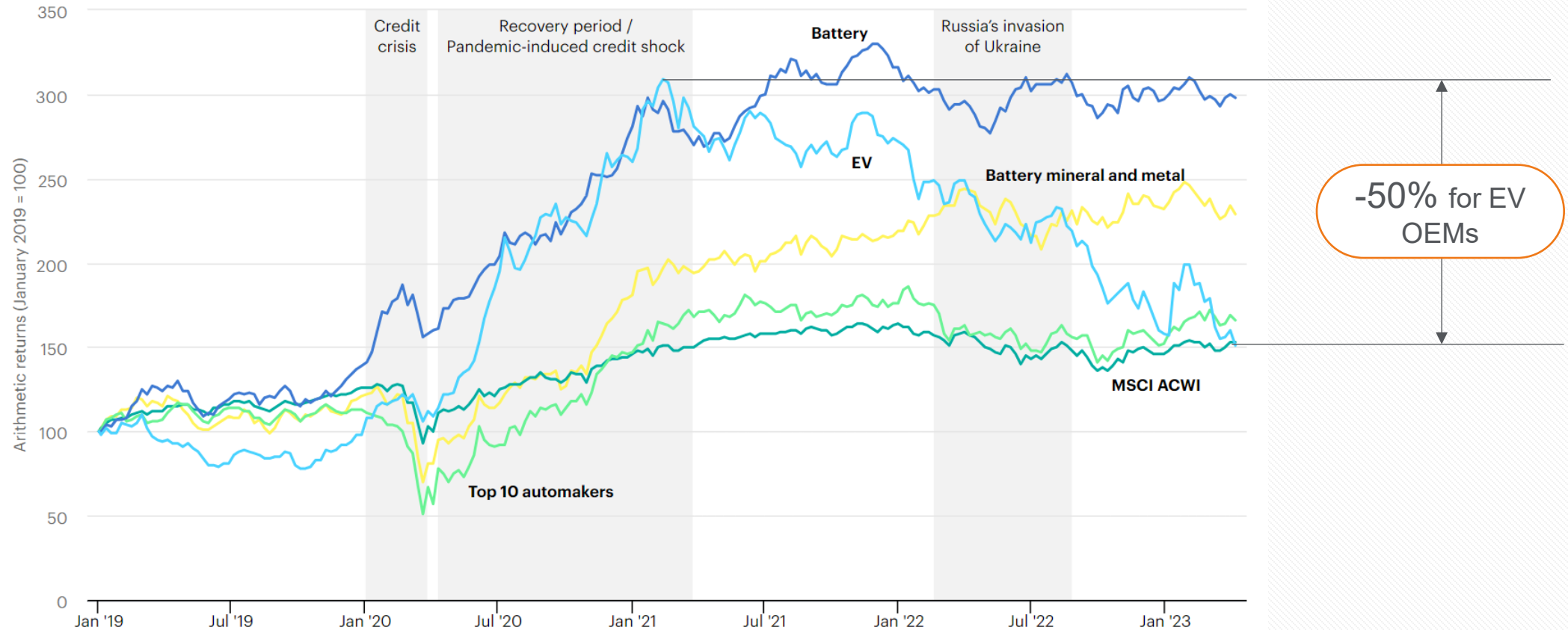


*Process-oriented operationalization  
Industry 4.0 production and supply chain transformation and optimization, vertical start-up, footprint streamlining, accelerated training, performance management system...*

# The pressure on automotive start-ups to deliver fundamental value has increased significantly, resulting in massive devaluation and early market exits for many brands



Stock financial performance of major car, battery and mining companies 2019 - 2023



# Market launches of new models often go wrong because the fundamentals of product strategy, development and industrialization are not understood – or badly managed

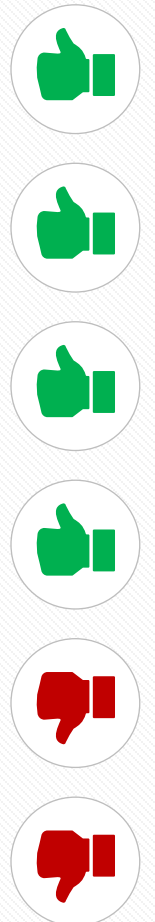
## Selected EV models

						...

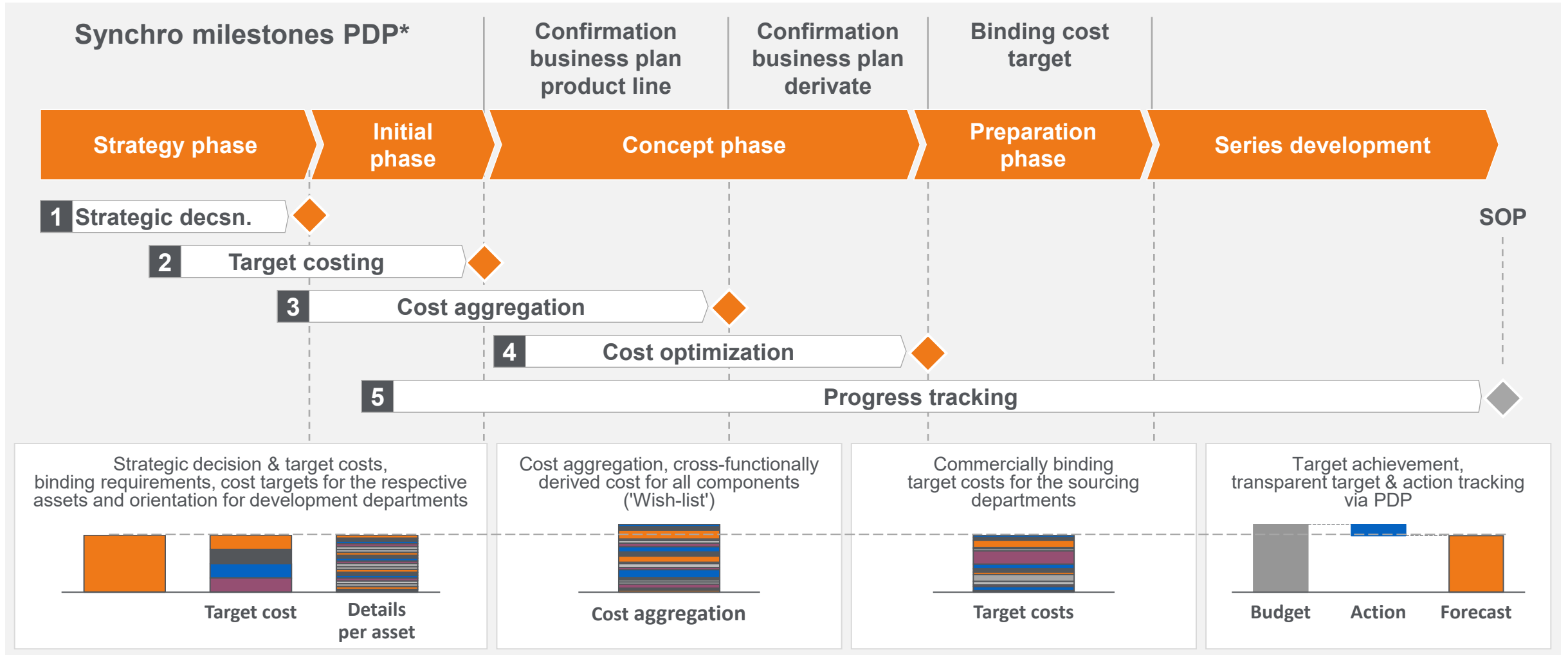
## Root causes of failure

- 1 A lack of understanding of target markets
- 2 No suitable development & manufacturing partners
- 3 Unrealistic business cases, lacking cost management
- 4 Underestimating EV vehicle development complexity
- 5 An inability to find and keep investors
- 6 Sometimes, it's also just down to bad luck!

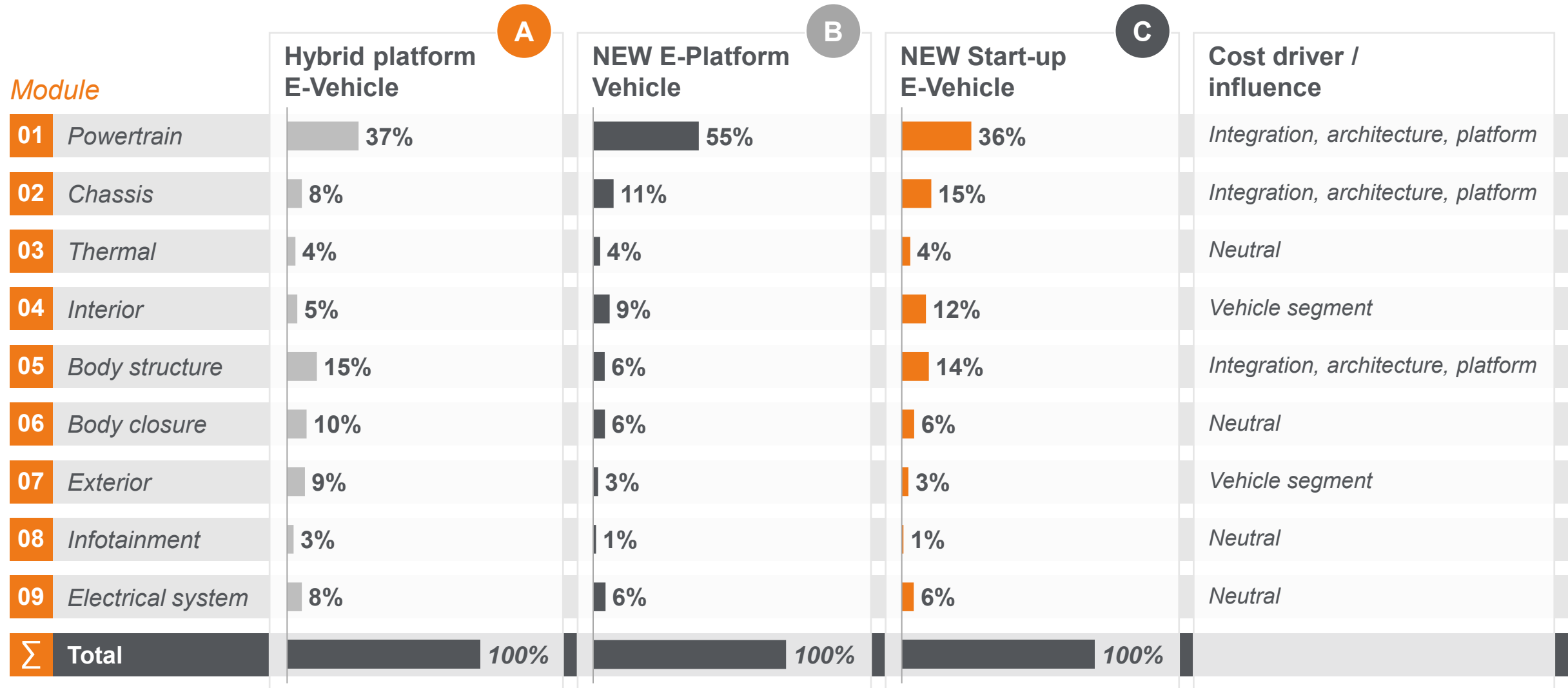
## Control



We help our clients avoid expensive mistakes by employing 'best-in-class' approaches that we have developed and rolled-out for leading, successful OEMs



We help our clients avoid expensive mistakes by employing ‘best-in-class’ approaches that we have developed and rolled-out for leading, successful OEMs



This ensures healthy margins for EV programs as we combine our unique capabilities in product-, tooling-, invest- and CO<sub>2</sub>e cost, fully adjusted to the anticipated volumes

 Our unique capability in cost-, tooling-, invest- and CO<sub>2</sub>e

### A snapshot of our current experience



SKODA

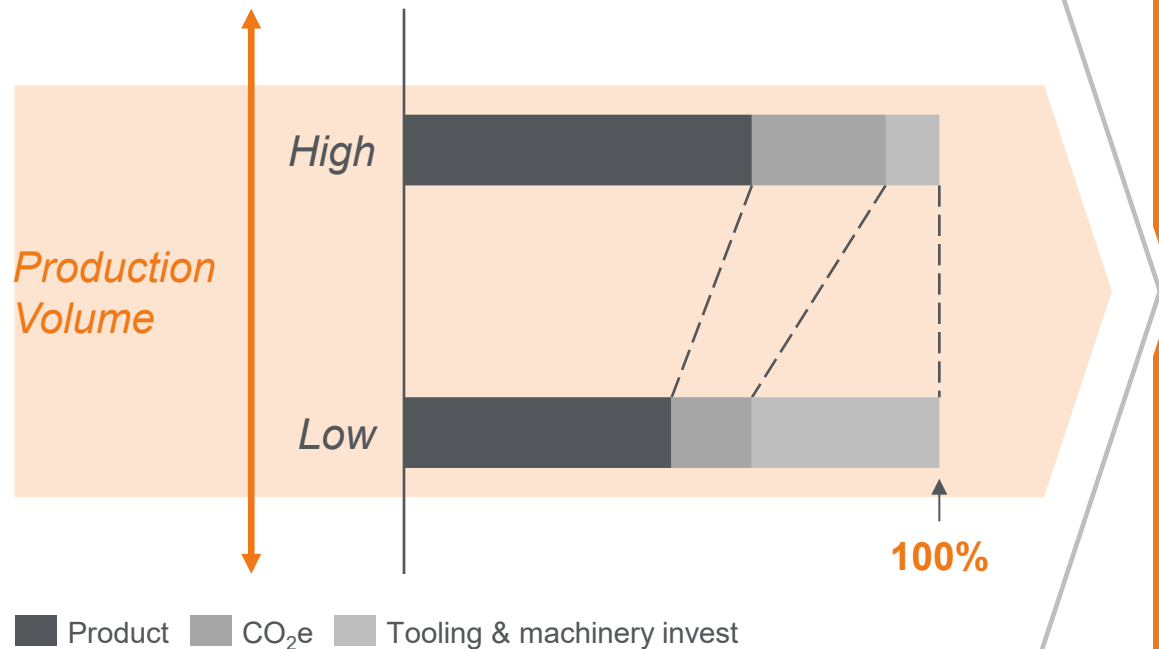


PEO

SONO MOTORS



### Relative importance of optimization levers



### Our Promise

We deliver successful, profitable large-scale programs based on:

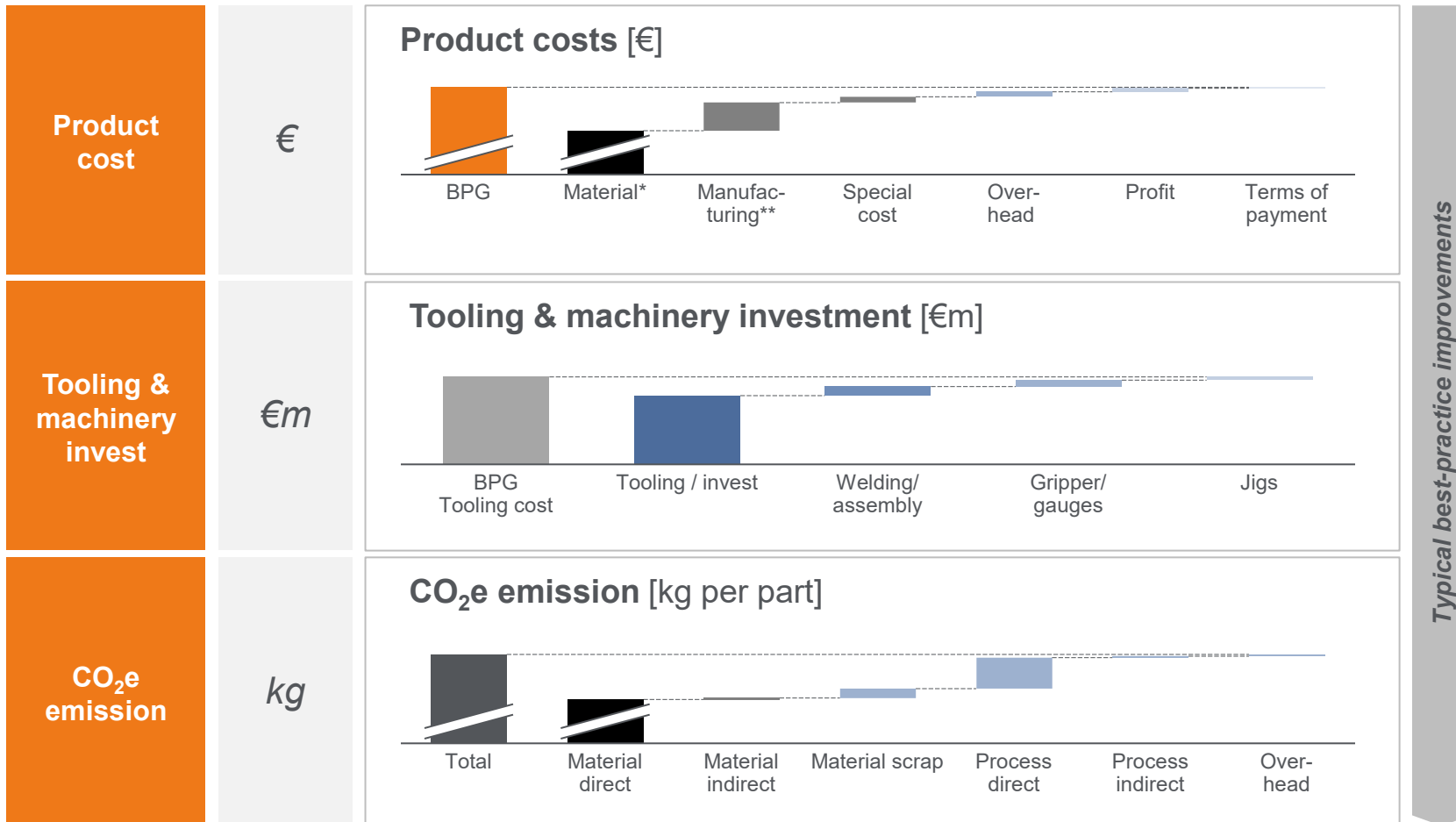
- **Comprehensiveness:** i.e., analysis of all the optimization levers relevant for production volumes  
→ integrated product-, tooling-, invest- and CO<sub>2</sub>e analysis
- **Granularity:** i.e., in-depth analysis of all technologies, processes, assumptions etc. across the supply chain  
→ the key to winning in complex supplier negotiations

*The above capabilities make us second-to-none in our field.*



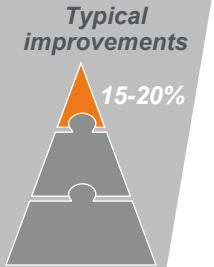
We help to bring transparency across all cost and success drivers, as our capability to integrate product-, tooling-, invest- and CO<sub>2</sub>e costing is unique

 Results summary of our analysis (typical example shown: an exterior part)

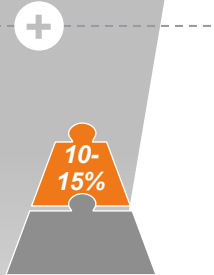


Typical best practice

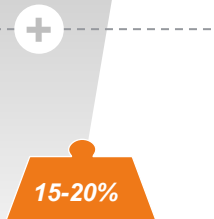
- Changes of materials
- Reduction of parts
- Reduction of density
- Optimized supply chain



- 'Best cost' country sourcing
- Tool design improvements
- Volume-adjusted tool concepts

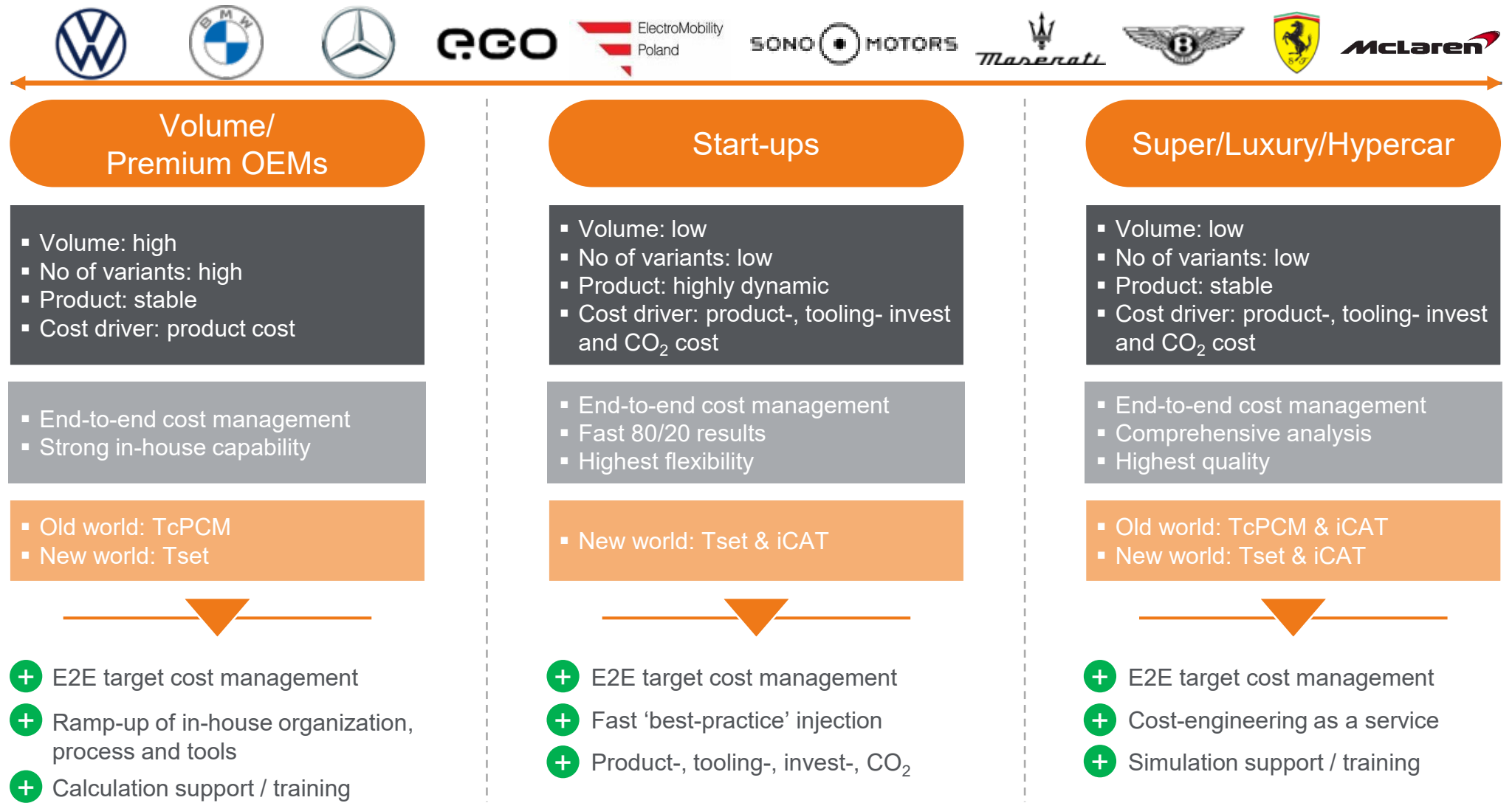


- Changes of materials
- Variation in recirculates
- Optimized operations
- Changes in supply chain



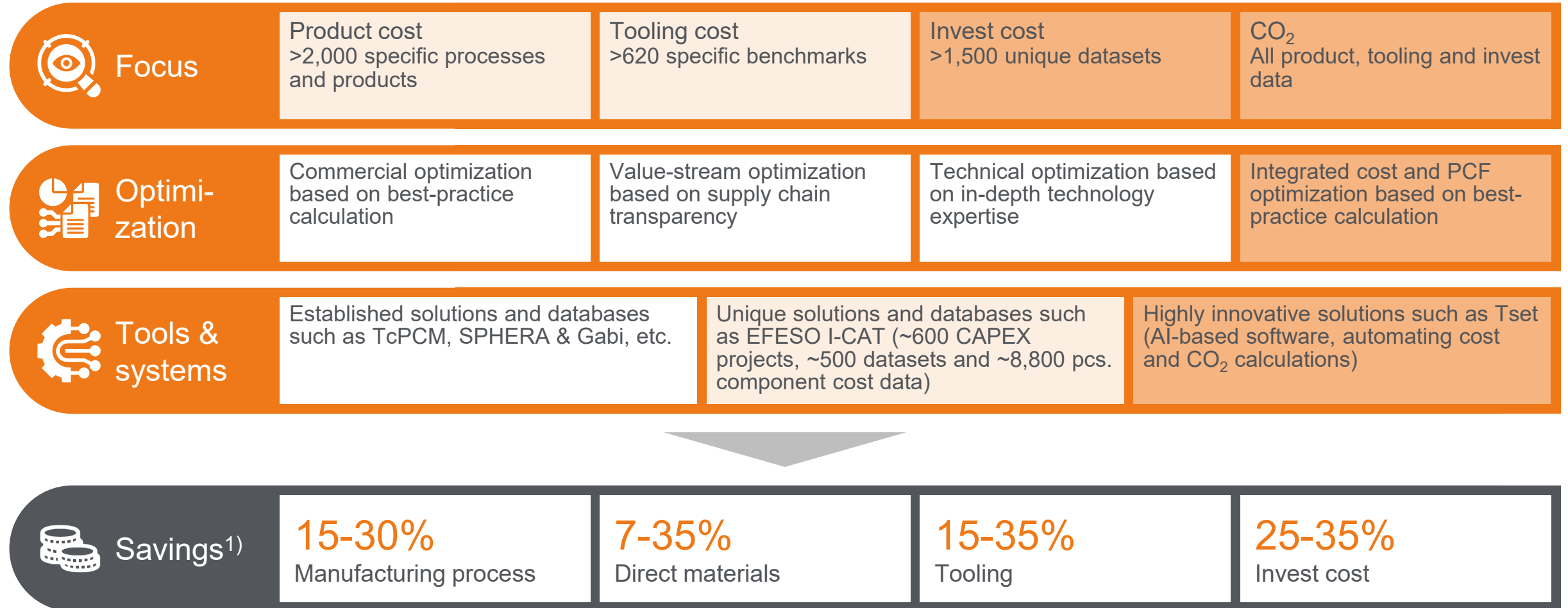


Our approach is always customized to the specific client's situation, and specifically focuses on what they need to do, in order to succeed...



Last but not least, this is backed-up by EFESO's benchmark data, adding cost-, technology- and process knowledge to fully evaluate and optimize car programs

### Results summary of our analysis



PCF = Product Carbon Footprint  
1) of respective cost type/category

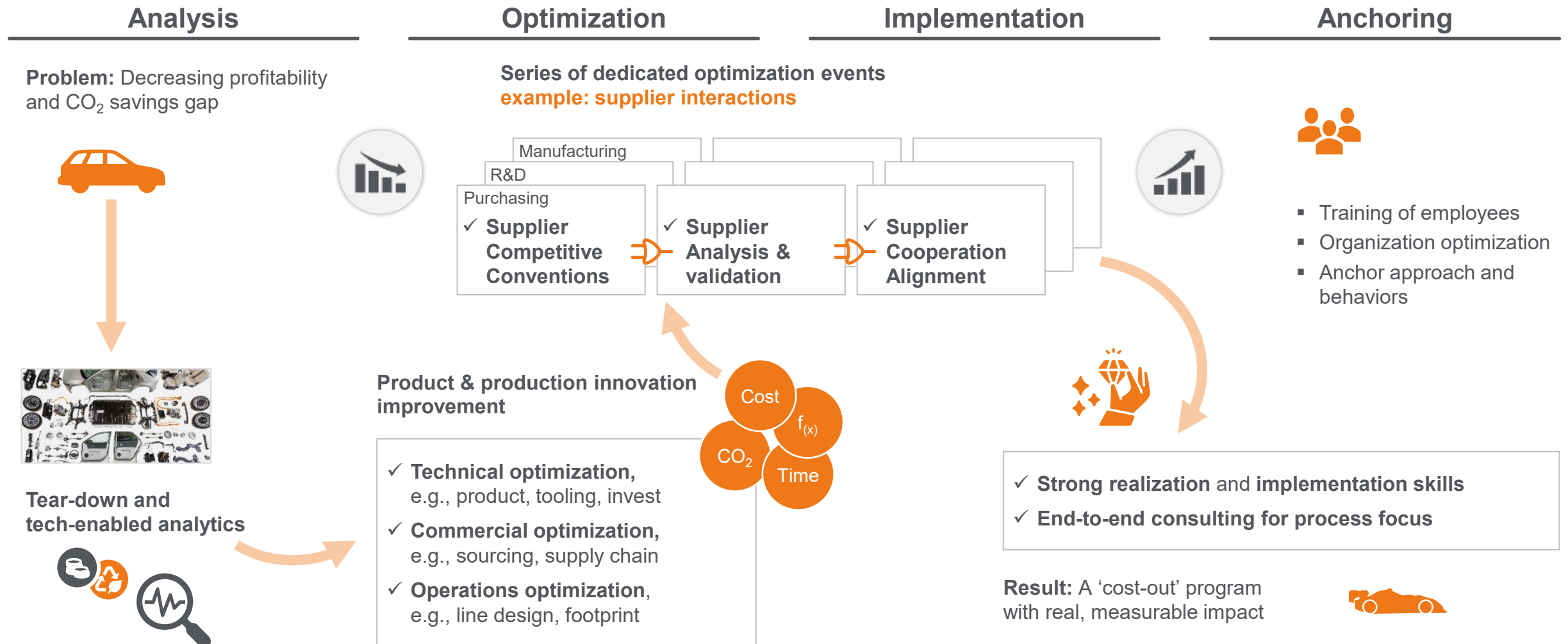


EFESO as market leader



EFESO as market innovator

# The key question for EV players is how to assure a healthy profit, based on a best-in-class cost management approach



# The specific challenge is to master the integrated optimization of all levers, i.e., cost-, invest- and CO<sub>2</sub>e

## Integrated optimization

1

### Design-to-cost

Control and reduce product-cost during product development.

**Develop cost-optimized products!**

2

### Design-to-invest

Add deep cost and technology knowledge on all aspects of tooling and invest.

**Optimize plant-/machine invest!**

3

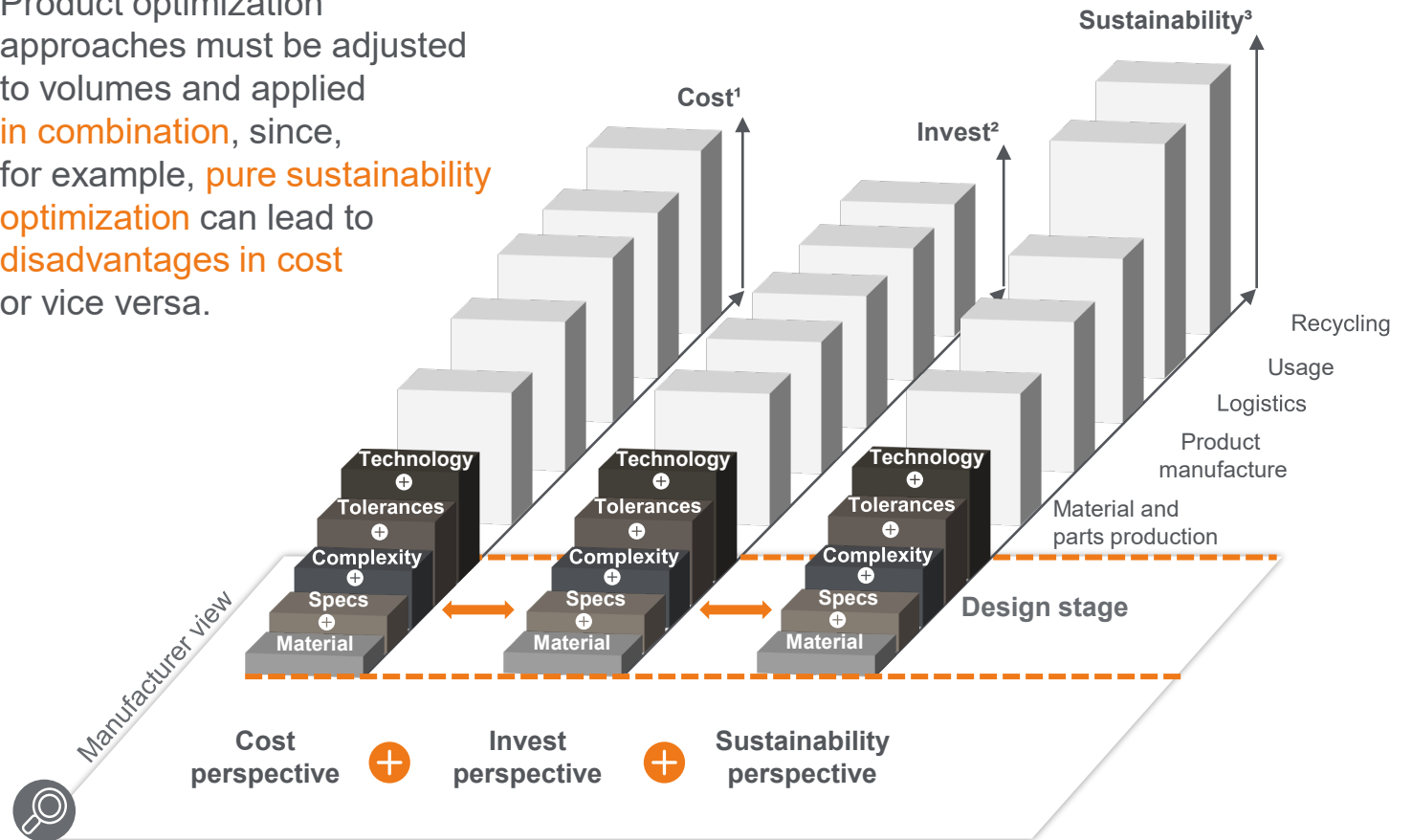
### Design-for-sustainability

Optimize footprint and supply chains. Rethink value to customer by considering Circularity Framework.

**Develop sustainable products!**

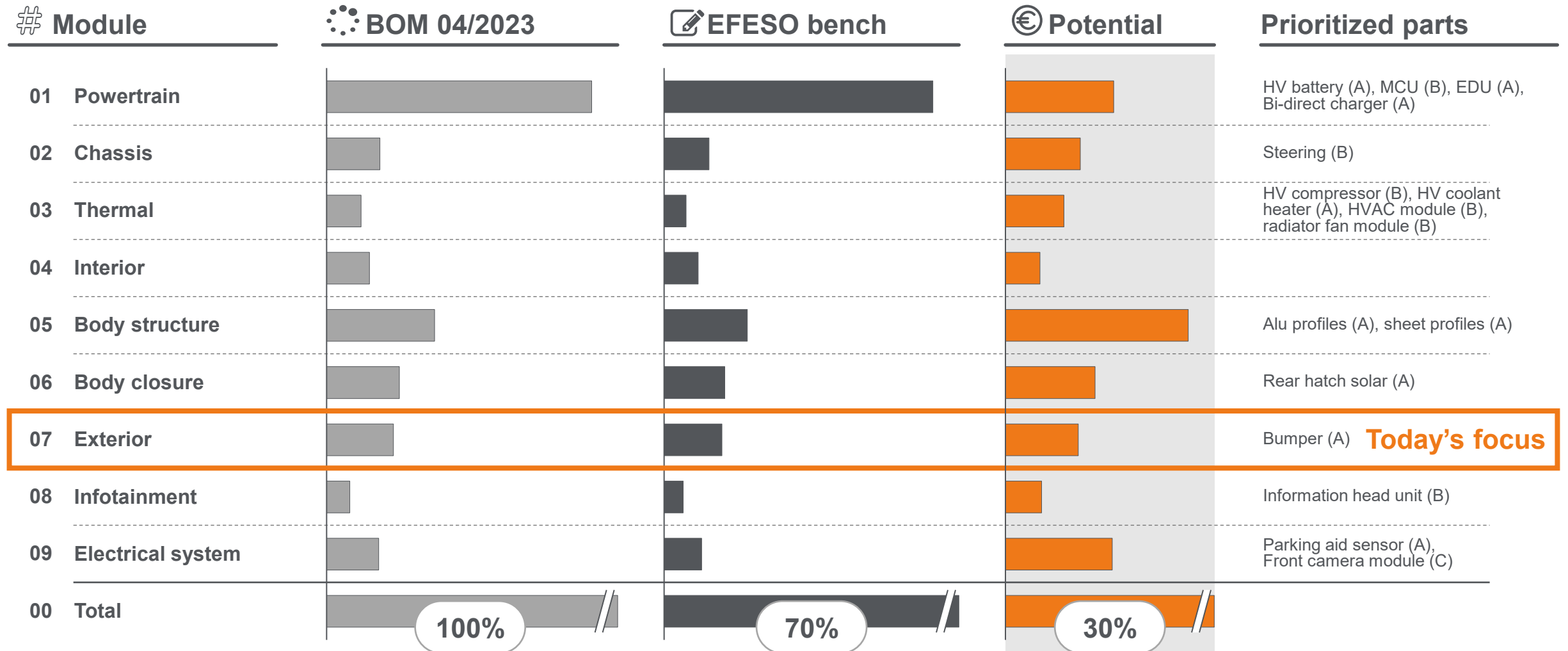
## Cumulative life-cycle view of cost, invest and sustainability

Product optimization approaches must be adjusted to volumes and applied **in combination**, since, for example, **pure sustainability optimization** can lead to **disadvantages in cost** or vice versa.



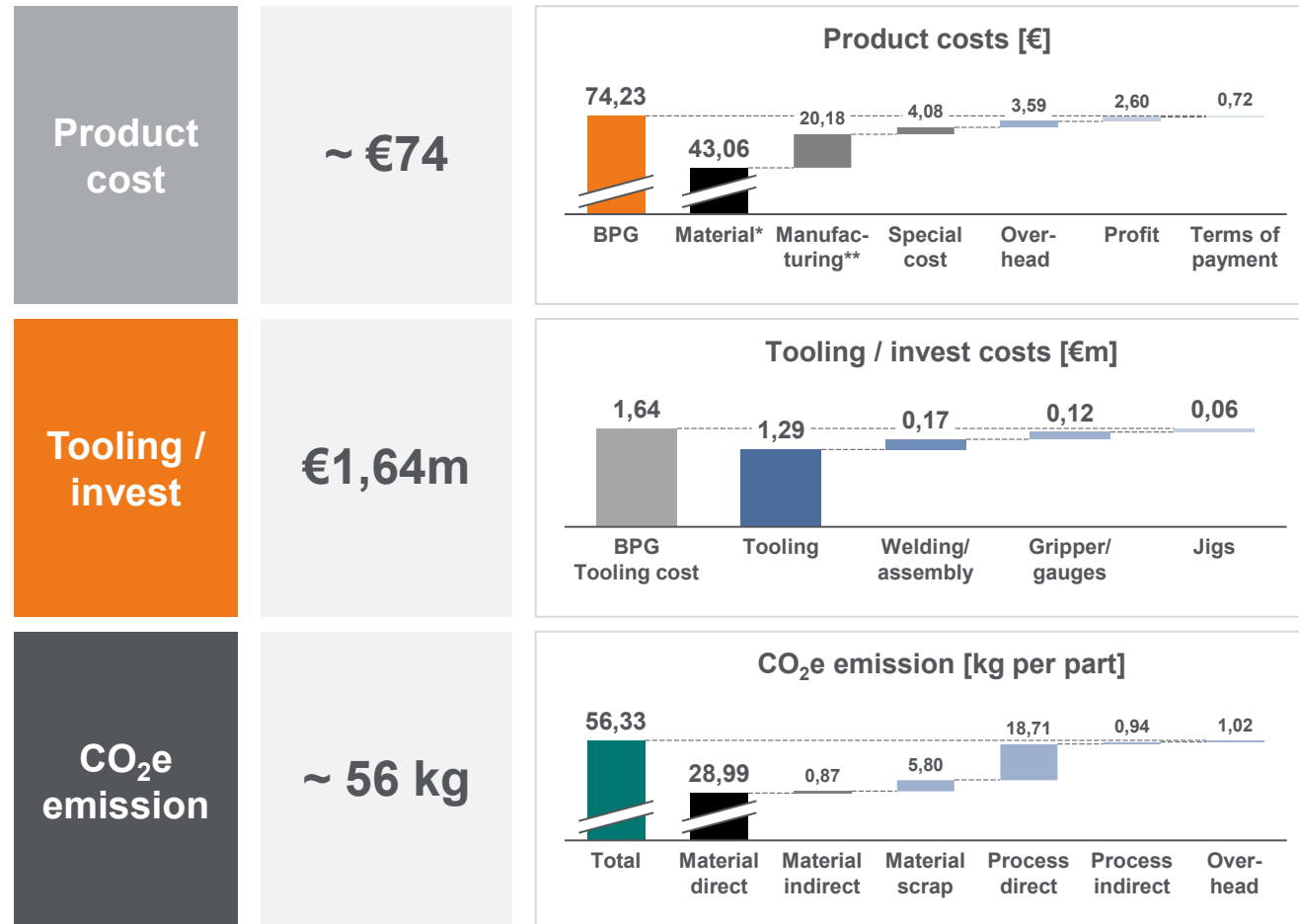
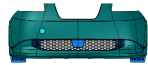
1) E.g., in € 2) E.g., in € 3) E.g., in CO<sub>2</sub>e

In the first instance, we deliver our 'performance check', i.e., a quick-scan of current cost status vs. benchmarks, to identify hot-spots for further analysis



The second stage is to deliver a detailed and integrated assessment of all the drivers of a business case (here, it's a passenger car bumper [low volume B/C segment])

## Results summary of bumper analysis



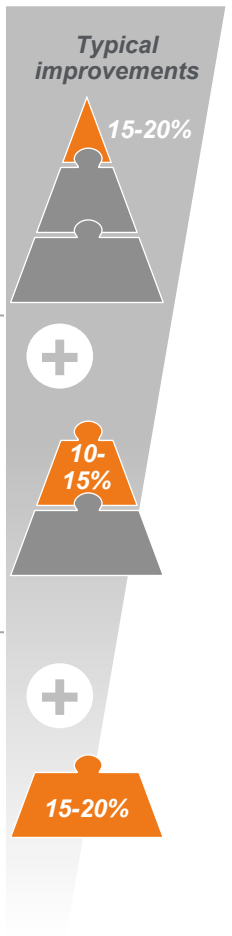
## Key traits

- Product costs for the bumper assembly add up to a total of €74 (A-price, excl. packaging and transport rack)
- Special focus is put on a careful selection of the right material mix
- Tooling cost (serial tools) calculated, arriving at a total cost of €1,64m
- Especially relevant for low volume OEMs as it will add ~ €16.40 of cost per part
- Focus on higher-quality CO<sub>2</sub>e KPI, instead of often used but misleading CO<sub>2</sub> KPI
- Equivalent CO<sub>2</sub>e emissions calculated (56 kg)

## Typical best-practice

- Changes of materials
- Reduction of parts
- Reduction of density
- Optimized supply chain
- Best cost country sourcing (BCCS)
- Tool design improvements
- Volume adjusted tool concepts
- Changes of materials
- Variation in recirculates
- Optimized operations
- Changes of supply chain

Typical best-practice improvements



# Focus 1: 'Product cost optimization'

Commercial, technical and supply chain optimization are fully addressed

Product cost

Tooling / invest

CO<sub>2</sub>e emission


DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

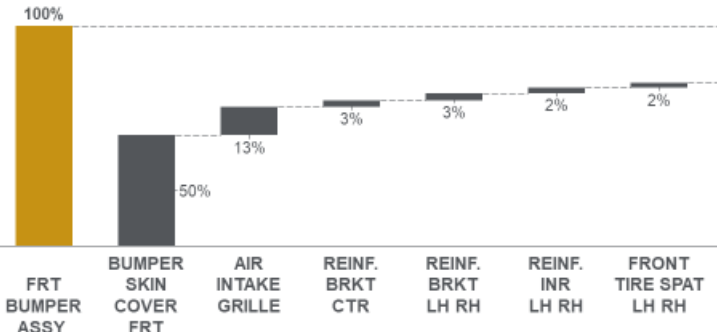
## Focus 1 "Product Cost Optimization":

### Deliver detailed bottom-up calculation to assure full cost transparency

EXAMPLE

Cost structure on part level [€]





Part	Percentage
FRT BUMPER ASSY	100%
BUMPER SKIN COVER FRT	50%
AIR INTAKE GRILLE	13%
REINF. BRKT CTR	3%
REINF. BRKT LH RH	3%
REINF. INR LH RH	2%
FRONT TIRE SPAT LH RH	2%

Source: Tsetinis EFESO 2023


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## Focus 1 "Product Cost Optimization":

### Deliver commercial-, technical- and supply chain optimization for parts

EXAMPLE

Concept 1
Client
Concept 2



	Concept 1	Client	Concept 2
Value [€]	60	-14	74
Value [€]			42
Value [€]			116

	Concept 1	Client	Concept 2
Dimension	1825 x 650 x 730 mm	1798 x 670 x 617 mm	1825 x 410 x 290 mm
Weight	7.227 g	9.030 g	8.068 g
Wall thickness	2,5 mm	3 mm	2,8 mm
Surface type	Painted	Painted	Painted
Painted surface	1,15 m <sup>2</sup>	1,79 m <sup>2</sup>	1,4 m <sup>2</sup>
Paint system	3 Layer / Gloss	3 Layer / Mat	3 Layer / Gloss
Remarks	PDC / Air Curtain	No PDC / No Air Curtain	PDC and Air Curtain
Part complexity	17 parts / 1 painted	11 parts / 1 painted	22 parts / 2 painted / 7 chromed

High volumes – Cost leadership

Cost optimized concept for modular platform

Medium system complexity and low weights

Low volumes – Start-up

Low system complexity, low functionality and modularity

Ramp-period

High volumes – tech. leadership

High functionality incl. drag optimized elements

decorative elements

Source: Tsetinis EFESO 2023

# Focus 2: 'Tooling / invest optimization'

Commercial, technical and supply chain optimization are fully addressed

Product cost

Tooling / invest

CO<sub>2</sub>e emission

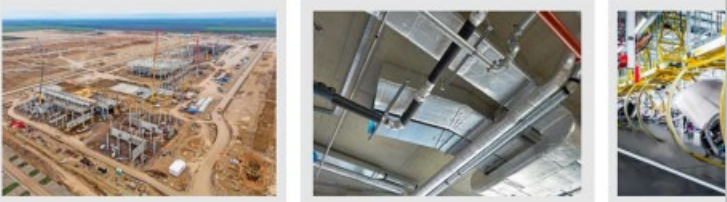
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## Focus 2 "Tooling & Invest Optimization"

We cover all capital expenditures, i.e. property, plant and all equipment

EXAMPLE

Buildings	Technical Building Services	Material Handling	Machinery & Equipment
<ul style="list-style-type: none"> <li>Civil engineering</li> <li>Land development</li> <li>Site preparation</li> <li>Foundations</li> <li>Roads</li> <li>Parking areas</li> <li>Buildings</li> <li>Etc.</li> </ul>	<ul style="list-style-type: none"> <li>Heating, ventilation &amp; air conditioning</li> <li>Fire protection</li> <li>Low voltage system</li> <li>Communication lines and IT networks</li> <li>Building automation</li> <li>Etc.</li> </ul>	<ul style="list-style-type: none"> <li>Overhead conveyors (EMS, P&amp;F)</li> <li>Floor conveyors (chain, roller, slat, skillet, etc.)</li> <li>Automatic</li> <li>Automatic systems</li> <li>Etc.</li> </ul>	<ul style="list-style-type: none"> <li>Machine tools</li> <li>Assembly lines</li> <li>Heat and surface treatment facilities</li> </ul>



Source: Tsetinis EFESO 2023

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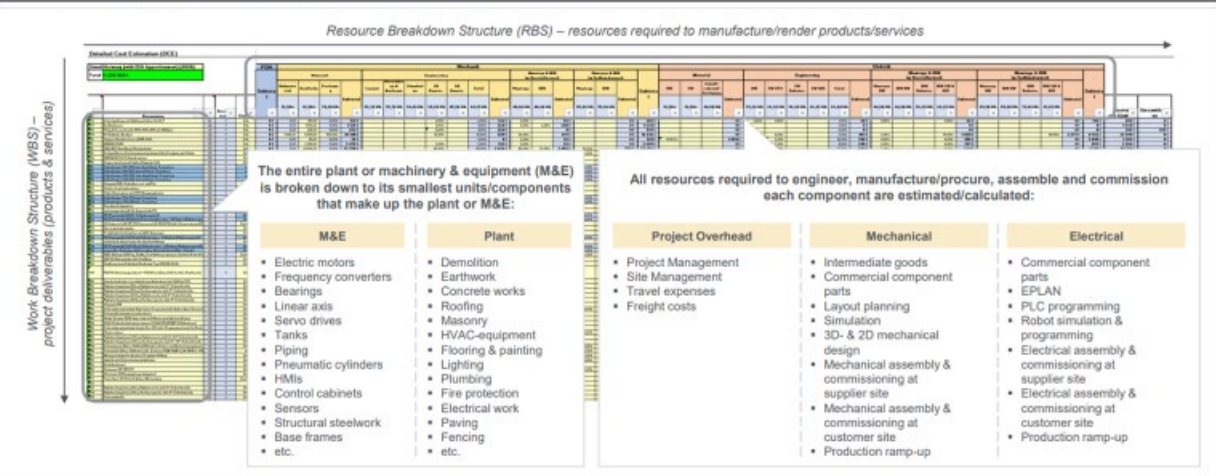
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## Focus 2 "Tooling & Invest Optimization"

### Cost Estimation & Calculation based on TC's unique benchmark database

WBS – RBS Matrix to Estimate/Calculate Material & Labor

Resource Breakdown Structure (RBS) – resources required to manufacture/render products/services



The entire plant or machinery & equipment (M&E) is broken down to its smallest units/components that make up the plant or M&E:

M&E	Plant
<ul style="list-style-type: none"> <li>Electric motors</li> <li>Frequency converters</li> <li>Bearings</li> <li>Linear axis</li> <li>Servo drives</li> <li>Tanks</li> <li>Piping</li> <li>Pneumatic cylinders</li> <li>HMI's</li> <li>Control cabinets</li> <li>Sensors</li> <li>Structural steelwork</li> <li>Base frames</li> <li>etc.</li> </ul>	<ul style="list-style-type: none"> <li>Demolition</li> <li>Earthwork</li> <li>Concrete works</li> <li>Roofing</li> <li>Masonry</li> <li>HVAC-equipment</li> <li>Flooring &amp; painting</li> <li>Lighting</li> <li>Plumbing</li> <li>Fire protection</li> <li>Electrical work</li> <li>Paving</li> <li>Fencing</li> <li>etc.</li> </ul>

All resources required to engineer, manufacture/procure, assemble and commission each component are estimated/calculated:

Project Overhead	Mechanical	Electrical
<ul style="list-style-type: none"> <li>Project Management</li> <li>Site Management</li> <li>Travel expenses</li> <li>Freight costs</li> </ul>	<ul style="list-style-type: none"> <li>Intermediate goods</li> <li>Commercial component parts</li> <li>Layout planning</li> <li>Simulation</li> <li>3D- &amp; 2D mechanical design</li> <li>Mechanical assembly &amp; commissioning at supplier site</li> <li>Mechanical assembly &amp; commissioning at customer site</li> <li>Production ramp-up</li> </ul>	<ul style="list-style-type: none"> <li>Commercial component parts</li> <li>EPLAN</li> <li>PLC programming</li> <li>Robot simulation &amp; programming</li> <li>Electrical assembly &amp; commissioning at supplier site</li> <li>Electrical assembly &amp; commissioning at customer site</li> <li>Production ramp-up</li> </ul>

Source: Tsetinis EFESO 2023

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# Focus 3: 'CO<sub>2</sub>e optimization'

## Detailed calculation of the 'product carbon footprint' to counteract CO<sub>2</sub> taxes

Product cost

Tooling / invest


CO<sub>2</sub>e emission

DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

### Focus 3 "CO<sub>2</sub>e Optimization": Understanding the impacts of upcoming CO<sub>2</sub> taxes on profit margins

Today

CO<sub>2</sub> tax for fossil fuels



Tomorrow

Automotive

Aerospace & Defense

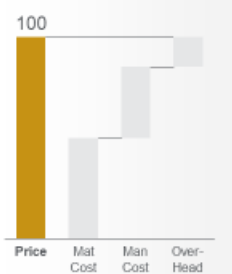
Agriculture

Machinery & Plant Industry

In the future, CO<sub>2</sub> tax will also be established in other sectors.

**OLD WORLD**

Pure cost accounting



Only product cost elements are considered.


**NEW WORLD**

New cost- and CO<sub>2</sub> accounting

120

How much CO<sub>2</sub>-tax will increase in the future is still open

**Product**



**Cost + CO<sub>2</sub> tax**

Industries will be forced to evaluate their Carbon Footprint - being conf

Source: Tsetinis EFESO 2023

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DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

### Focus 3 "CO<sub>2</sub>e Optimization": Understand status-quo, simulate alternatives, achieve optimum configuration

Detailed cost & carbon structure

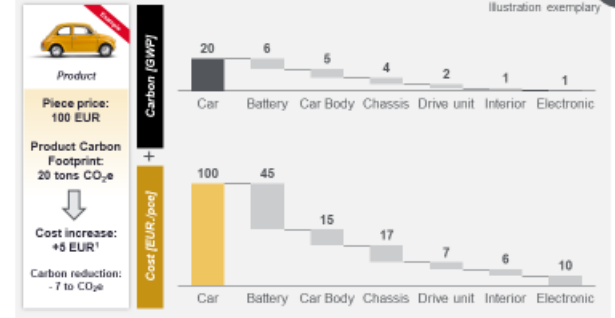


Illustration exemplary

Implementing CO<sub>2</sub> reduction measures

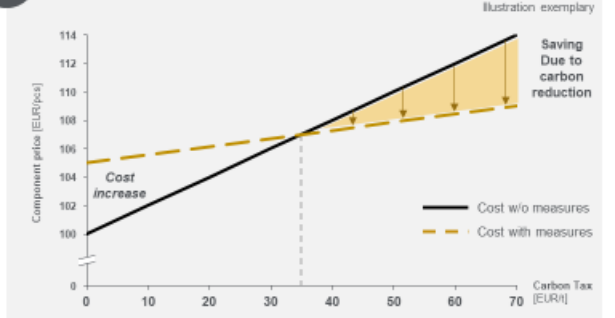


Illustration exemplary

Each lever effects carbon emission and costs. It's key to find the right balance for improvements. Therefore, it is necessary to focus on the holistic analysis.

Decreasing the product's carbon footprint, despite add-on costs, can enable an overall lower piece price at higher CO<sub>2</sub> tax rates.

Transparency regarding the cost of CO<sub>2</sub> and net benefit of improvement measures is key to reducing cost.

Source: Tsetinis EFESO 2023

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# The final result? We deliver cost savings of up to 40% in the programs we support



## Initial situation

- All struggling to launch e-mobility successfully
- Development behind schedule, data is incomplete
- Product-, tooling and invest costs are significantly above the targets, CO<sub>2</sub> tax impacts not understood
- Cost management process and optimization approaches missing
- ➔ Approach required to improve product launch and business case

## Approach / method

- Holistic profitability program to improve business case:
- Performance check
  - Product, tooling, invest on CO<sub>2</sub> costing
  - Benchmarking
  - Integrated optimization incl. our 'fresh-eye'
  - Supplier identification, negotiation and awarding
  - Measure tracking and BOM management
  - Cost management blueprint and know-how transfer

## Customer value added



**Up to 40%** sustainable cost savings potentials



**Full** transparency over the entire value chain (costs, tasks, risks...)



Know-how transfer and training to assure **skill-up**

