

The background features a collage of financial data visualizations. At the top, there are two candlestick charts with various indicators and annotations. Below these are several dashboard widgets, including gauge charts showing percentages (25%, 50%, 75%) and summary data sections. A large, semi-transparent lightbulb is centered in the middle of the image, symbolizing ideas and innovation. The overall aesthetic is professional and data-driven.

EFESO
MANAGEMENT CONSULTANTS

INNOVATING IN FUTURE MOBILITY

Integrated cost management and optimization for profitable e-mobility programs

STRATEGY & INNOVATION

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 CO₂e 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 CO₂e 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, CO₂e) as well as value-chain assumptions

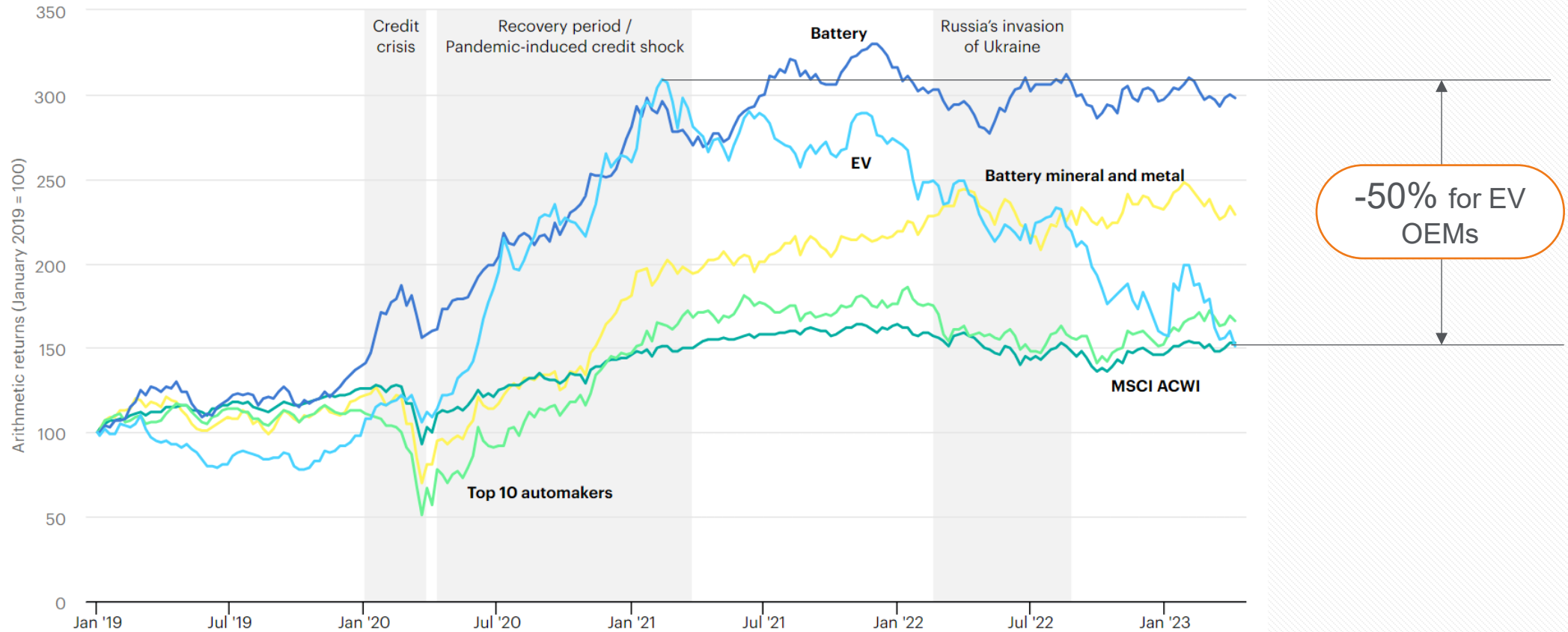


*Process-oriented operationalization
Industry 4.0 production and supply chain transformation and optimization, vertical start-up, footprint streamlining, accelerated training, performance management system...*

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

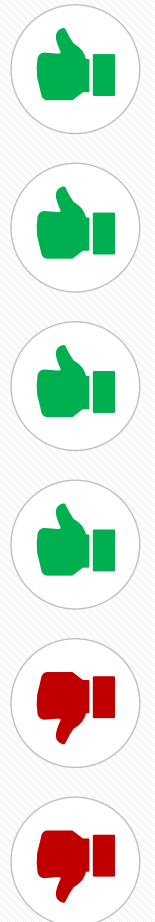
Selected EV models

						...

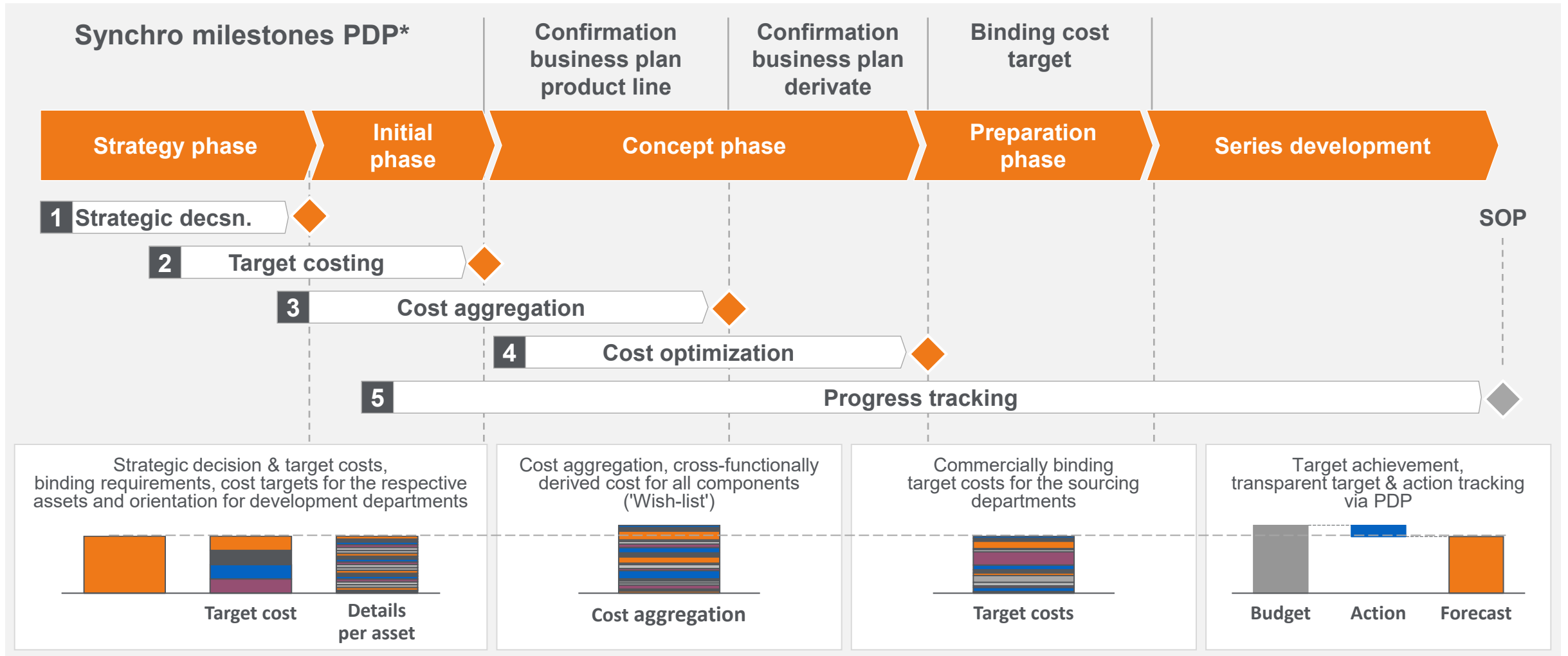
Root causes of failure

- 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!

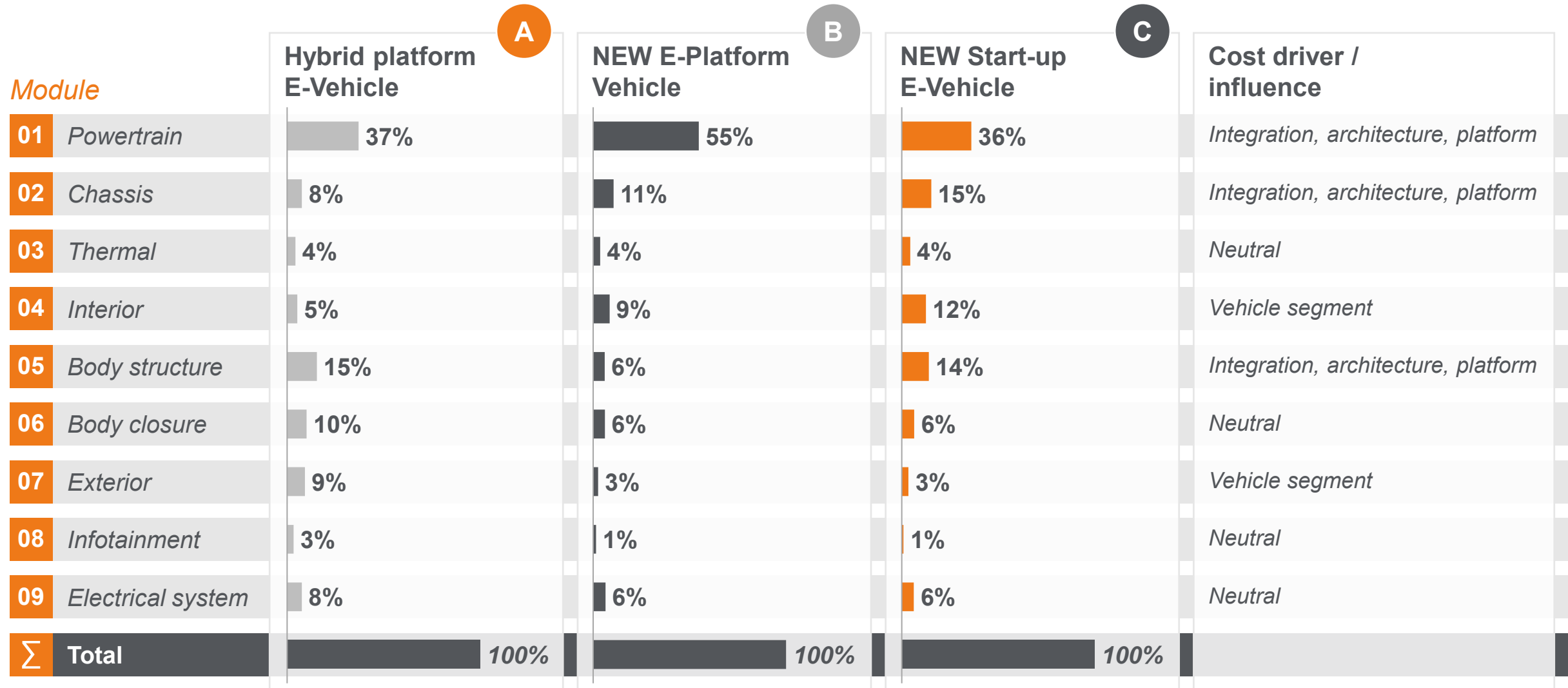
Control



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 CO₂e cost, fully adjusted to the anticipated volumes

 Our unique capability in cost-, tooling-, invest- and CO₂e

A snapshot of our current experience



SKODA

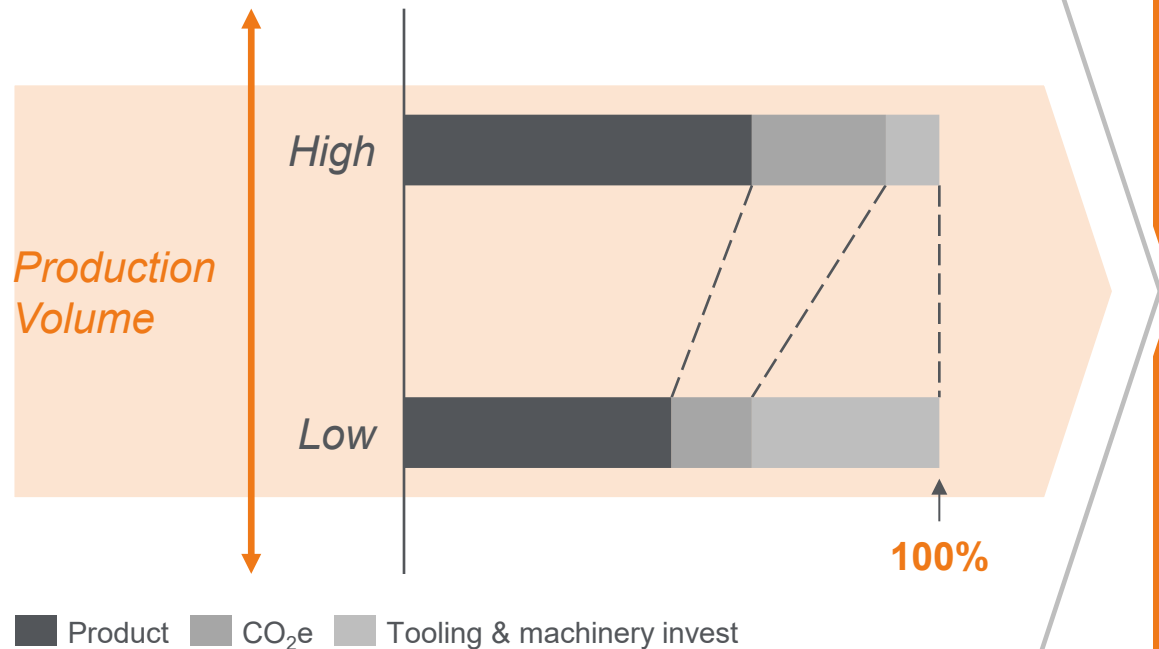


PEO

SONO MOTORS



Relative importance of optimization levers



Our Promise

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

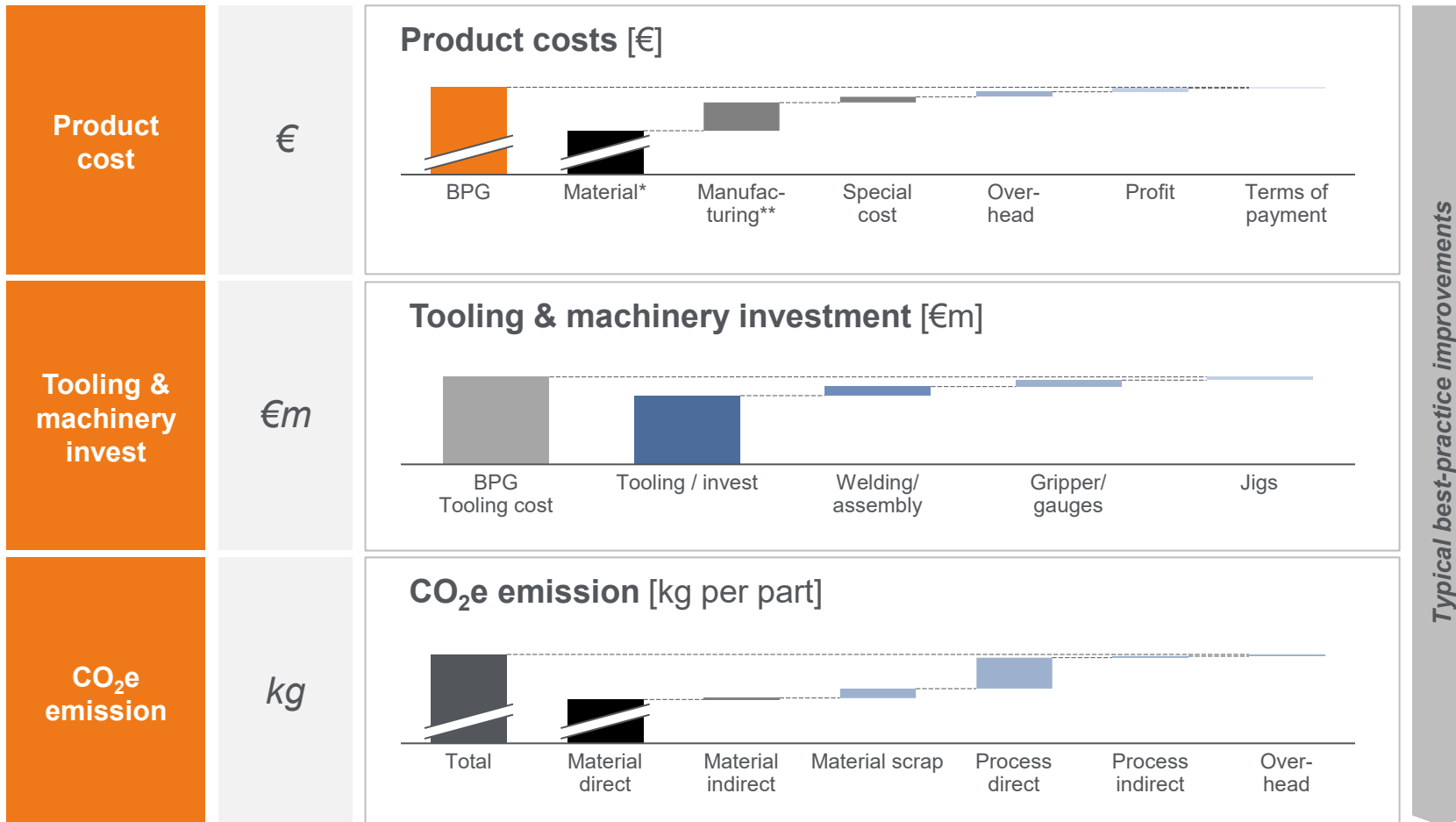
- **Comprehensiveness:** i.e., analysis of all the optimization levers relevant for production volumes
→ integrated product-, tooling-, invest- and CO₂e analysis
- **Granularity:** i.e., in-depth analysis of all technologies, processes, assumptions etc. across the supply chain
→ the key to winning in complex supplier negotiations

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



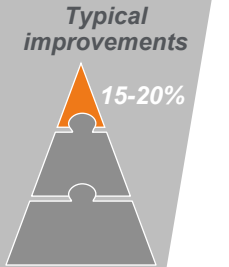
We help to bring transparency across all cost and success drivers, as our capability to integrate product-, tooling-, invest- and CO₂e costing is unique

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

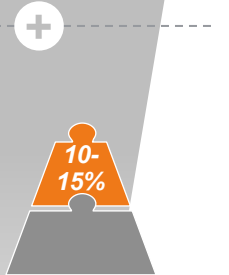


Typical best practice

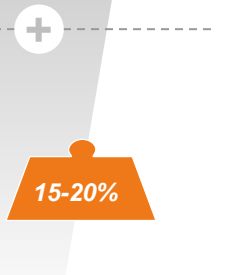
- Changes of materials
- Reduction of parts
- Reduction of density
- Optimized supply chain



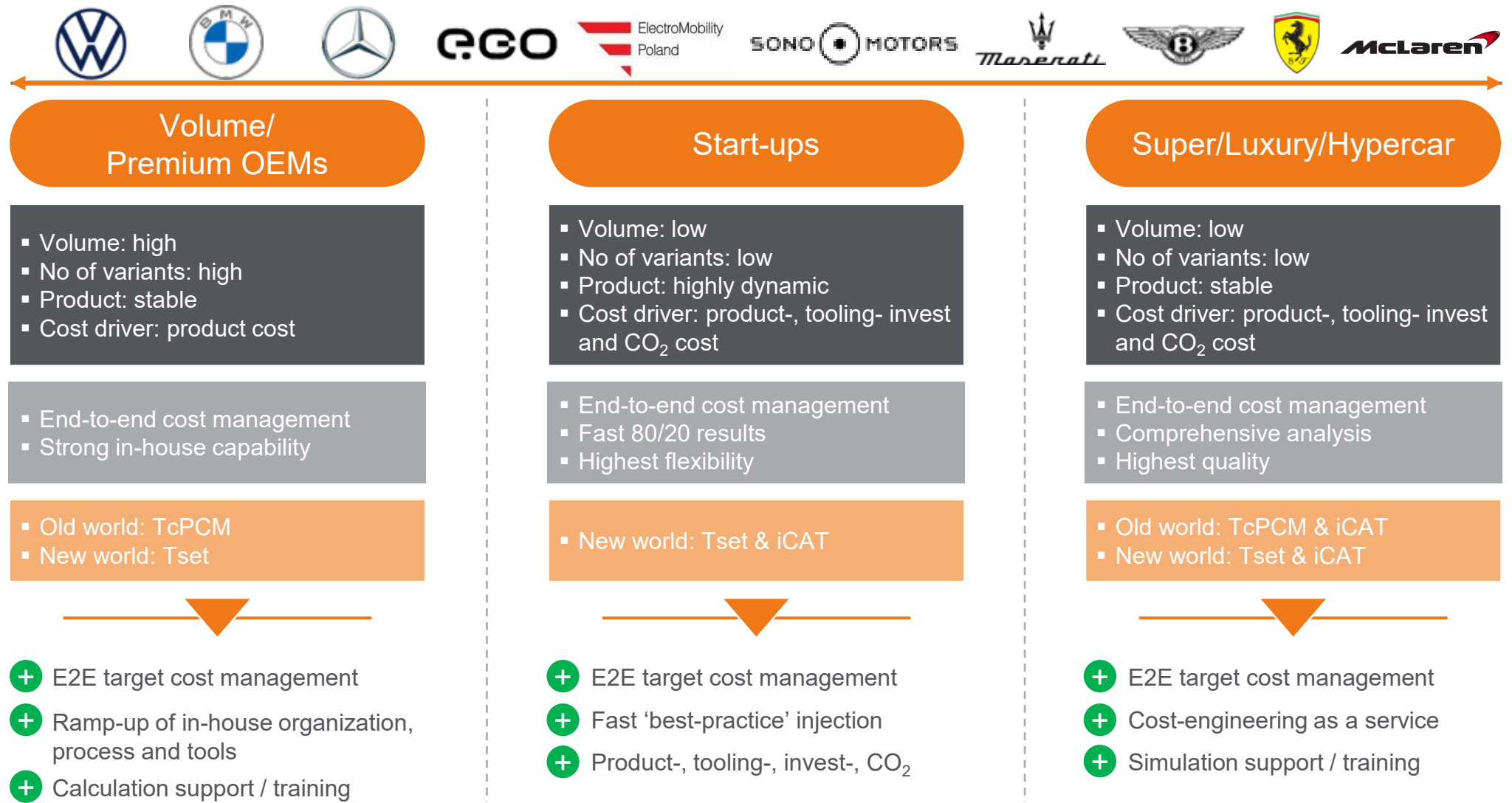
- 'Best cost' country sourcing
- Tool design improvements
- Volume-adjusted tool concepts



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

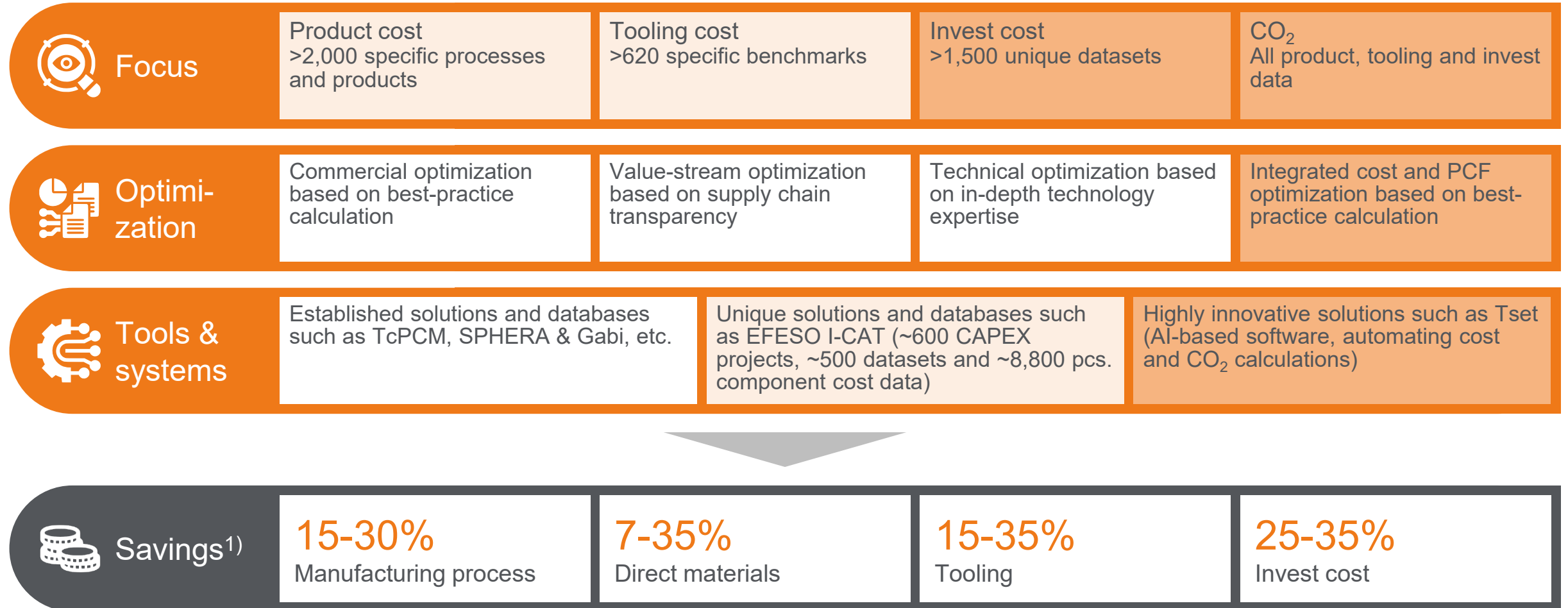


Our approach is always customized to the specific client's situation, and specifically focuses on what they need to do, in order to succeed...



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

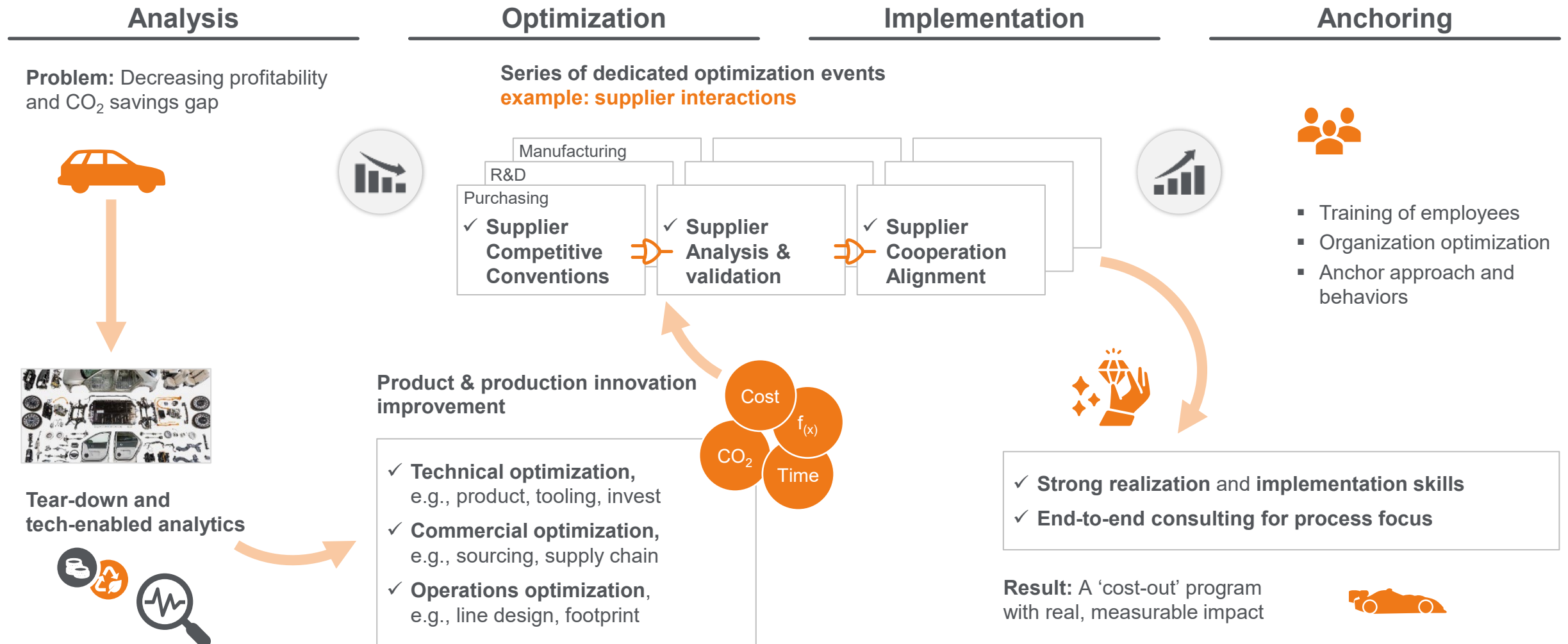


EFESO as market leader



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 CO₂e

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

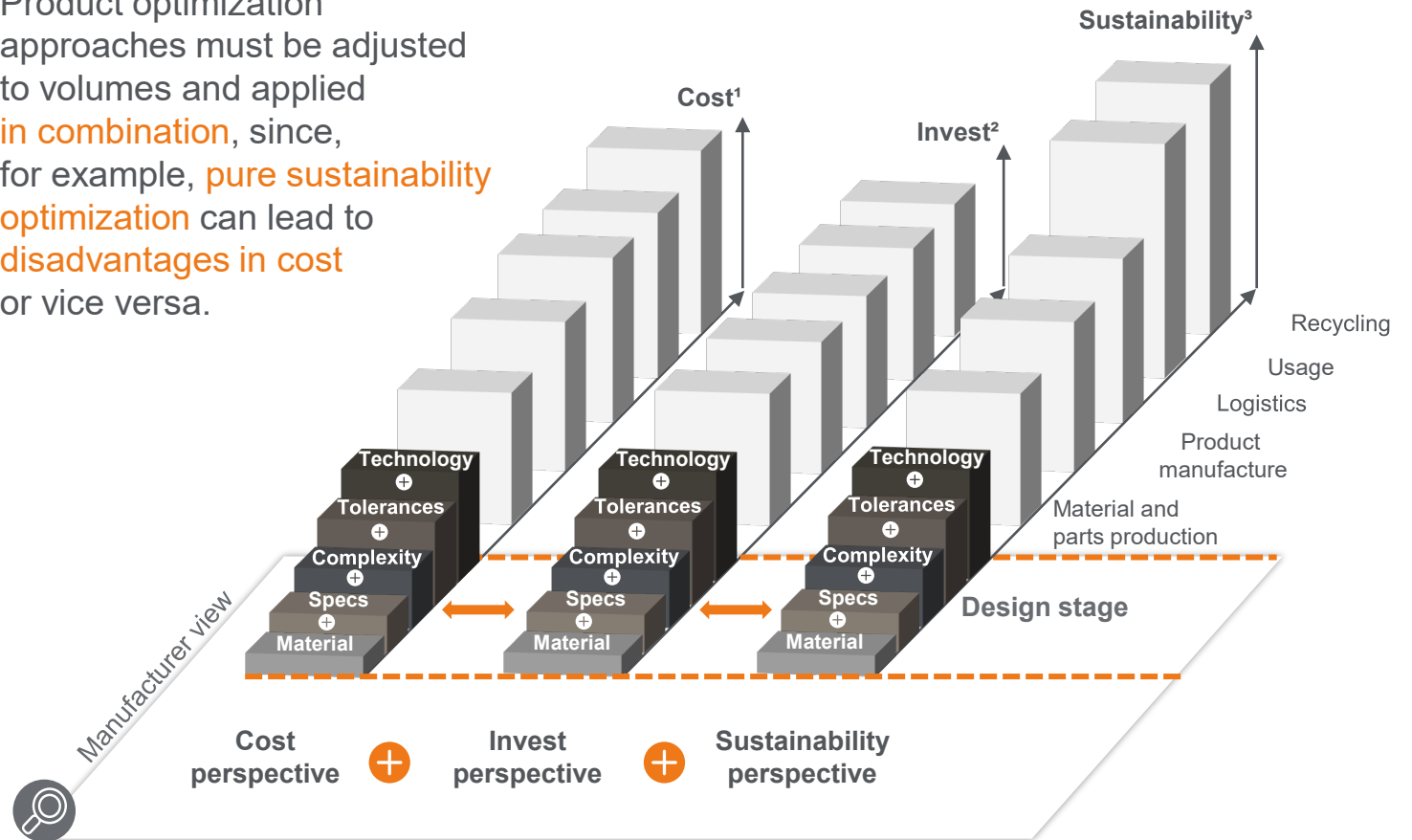
Design-for-sustainability

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

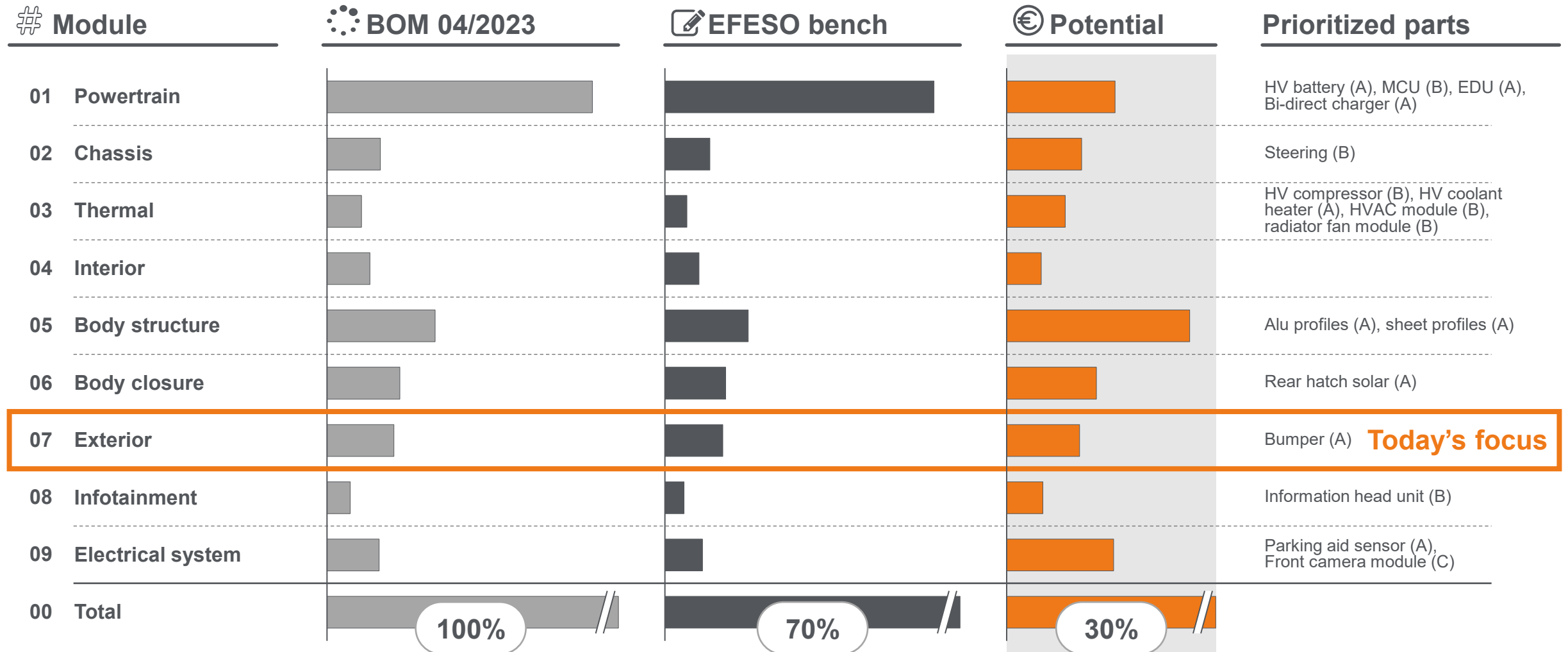
Develop sustainable products!

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.

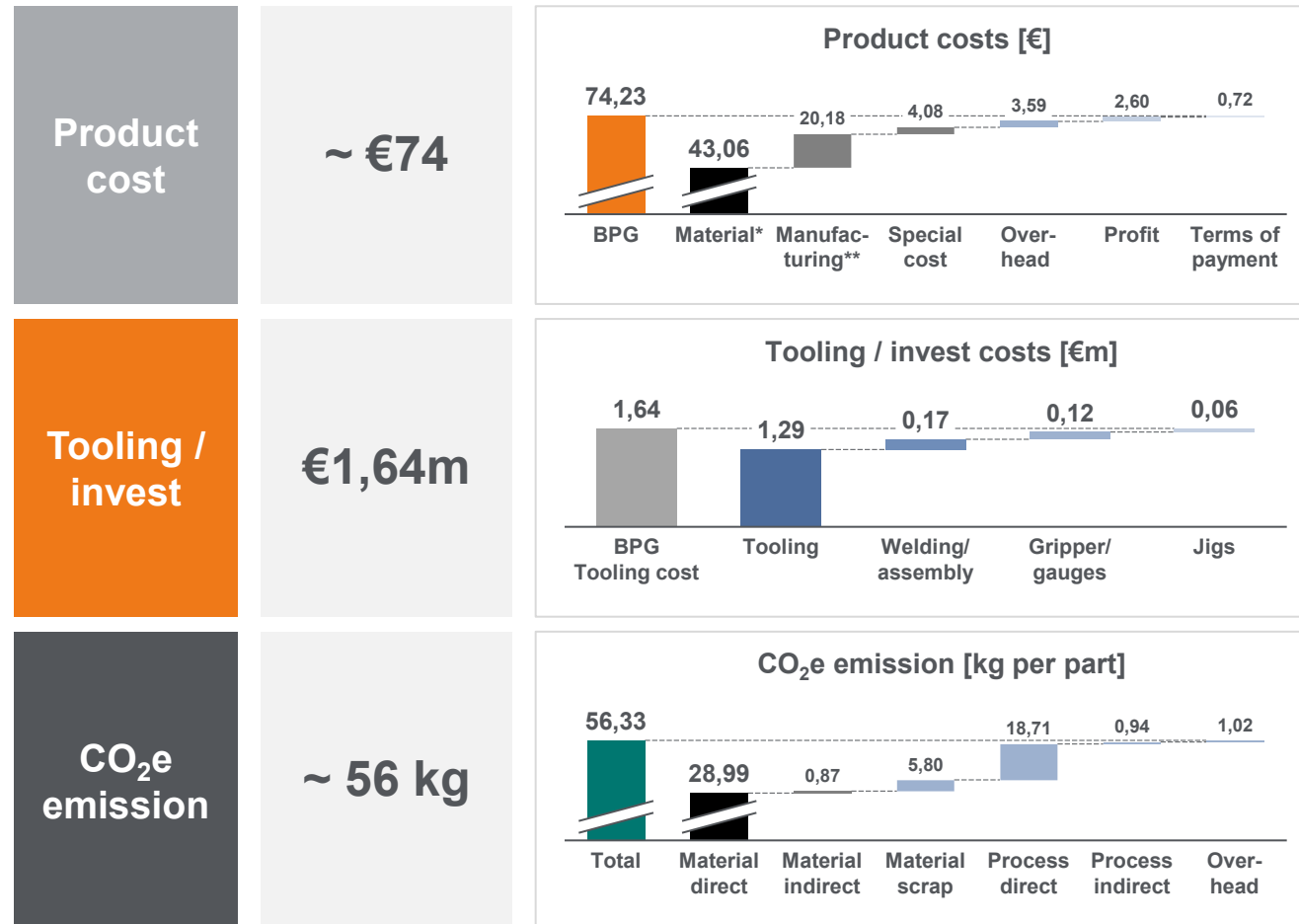
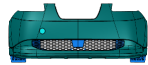


In the first instance, we deliver our 'performance check', i.e., a quick-scan of current cost status vs. benchmarks, to identify hot-spots for further analysis



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



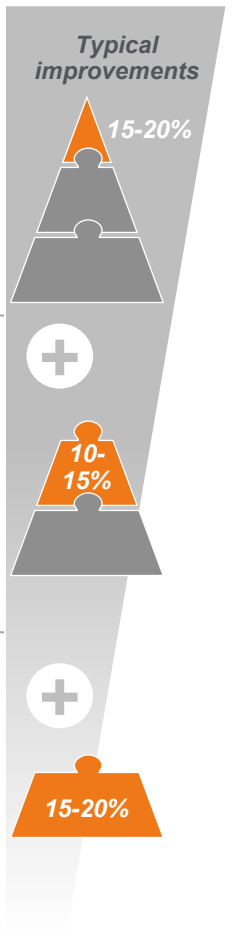
Key traits

- 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 CO₂e KPI, instead of often used but misleading CO₂ KPI
- Equivalent CO₂e 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

CO₂e emission


DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

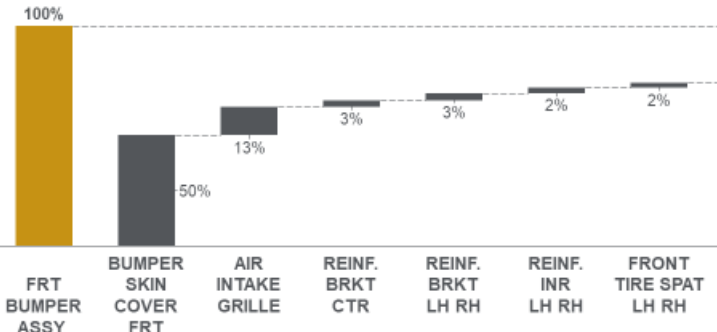
Focus 1 "Product Cost Optimization":

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


DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

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 ²	1,79 m ²	1,4 m ²
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
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Source: Tsetinis EFESO 2023



Focus 2: 'Tooling / invest optimization'

Commercial, technical and supply chain optimization are fully addressed

Product cost

Tooling / invest

CO₂e emission

DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

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

Source: Tsetinis EFESO 2023

DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

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

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

Source: Tsetinis EFESO 2023

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Focus 3: 'CO₂e optimization'

Detailed calculation of the 'product carbon footprint' to counteract CO₂ taxes

Product cost

Tooling / invest

CO₂e emission

DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

Focus 3 "CO₂e Optimization": Understanding the impacts of upcoming CO₂ taxes on profit margins

Today

CO₂ tax for fossil fuels

Tomorrow

Automotive
Aerospace & Defense
Agriculture
Machinery & Plant Industry

In the future, CO₂ tax will also be established in other sectors.

OLD WORLD

Pure cost accounting

Price: 100

Only product cost elements are considered.

NEW WORLD

New cost- and CO₂ accounting

120

How much CO₂-tax will increase in the future is still open

Product

Cost + CO₂ tax

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

Source: Tsetinis EFESO 2023

DESIGNING FOR PROFITABILITY AND SUSTAINABILITY

Focus 3 "CO₂e Optimization": Understand status-quo, simulate alternatives, achieve optimum configuration

Detailed cost & carbon structure

Illustration exemplary

Implementing CO₂ 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 CO₂ tax rates.

Transparency regarding the cost of CO₂ 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, CO₂ 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 CO₂ 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**

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