



Vehicle concepts & -systems

Module 1 Strategy and Basics to Product Development
WS 2022/2023

What you can expect from this lecture?

- INTERACTION!
- Fun with vehicle development
- Useful methods and tools
- Basics to vehicle systems and components
- „Hands On“ – and work ;)
- Practical experience on the vehicle
- Shared experience regarding your career
- Team based project work
- „Self-developed“ vehicle concept



<https://youtu.be/zmixrlz8Ilg>

Questions? Please ask!

[www.mercedes-amg.com]

First task

Please build teams with a size of 5-6 students
The teams will work together throughout all modules / sessions regarding the research project

Module 1: Strategy & Product development

- Interactive brainstorming to influence factors of vehicles
- Terminology and basics
- Strategy & Strategic Planning
- Reference Model to Product development
- Models to evaluate product requirements
- Management of large variety
 - Standardization vs. Differentiation
 - Module & platform strategy

optional

Time schedule:
Morning:
Basics on vehicle development
Afternoon / next 2 weeks:
Teamwork

Module 1: Strategy & Product development

- **Interactive brainstorming to influence factors of vehicles**
- Terminology and basics
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Basics

- Parameters: general terminology
- Influence Factors: External, not influenceable (e.g. inflation rate)
- Attributes / Features: Internal, influenceable (e.g. vehicle weight)

Some thoughts on vehicles...

Types of vehicles

Driving resistance

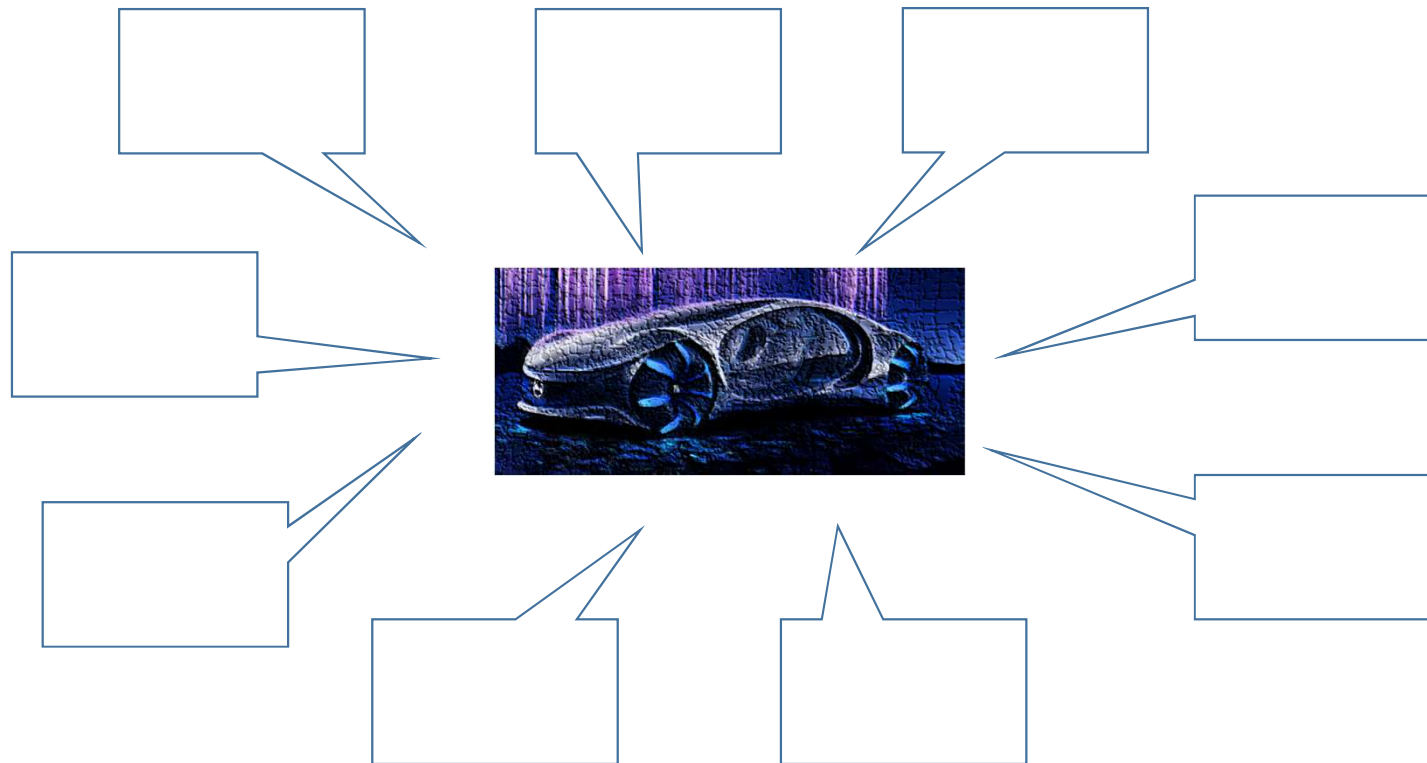
Vehicle dynamics &
forces

Energy demand

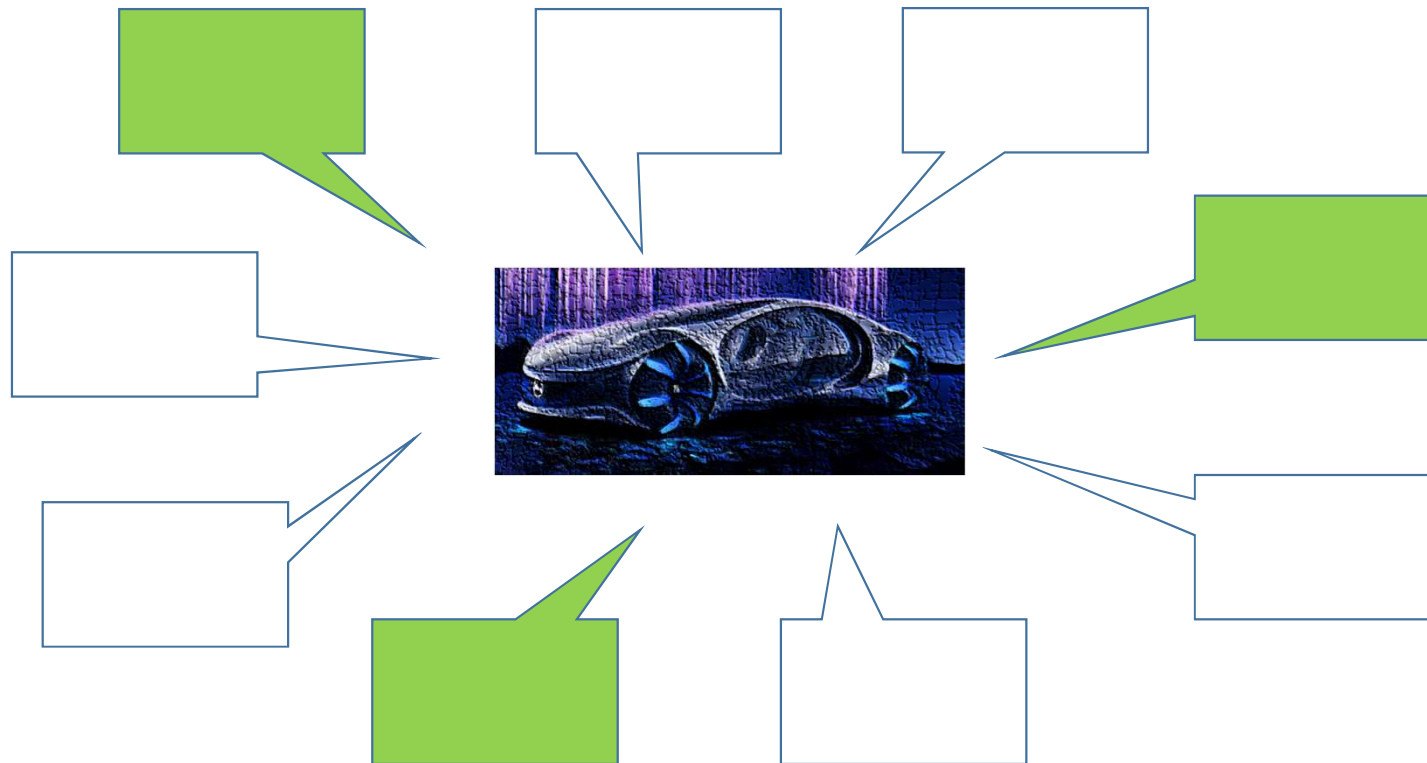
- Real coast down and test bench cycles
- Influence Factors on real driving

Influence factors of a vehicle concept

Brainstroming
5 min time

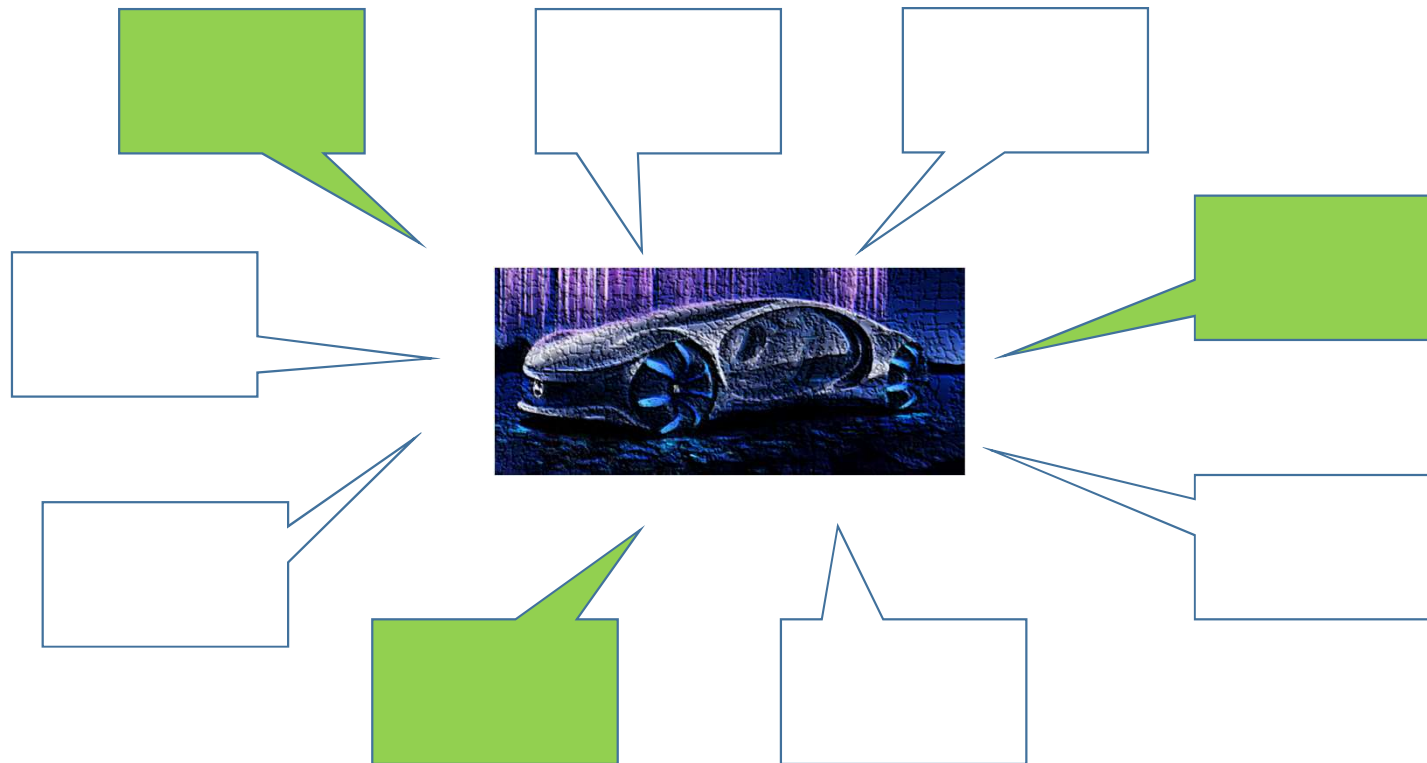


What are key influence factors?



What are key attributes / technical features of a vehicle concept?

Brainstroming
5 min time



Visionary vehicle concepts



Inspiziert von der Zukunft: Das Mercedes-Benz VISION AVTR.

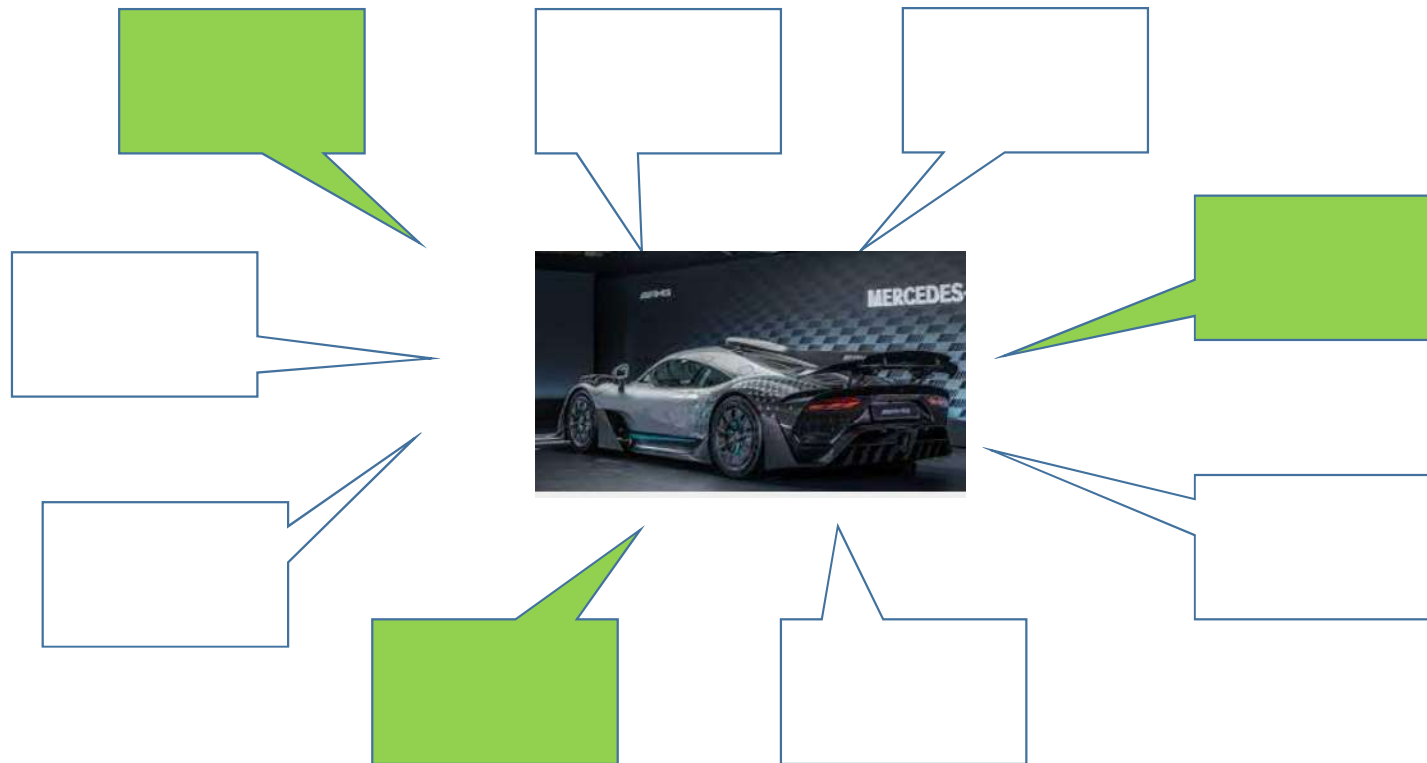
Performance Vehicles

20,832 kilometres, 73 curves, 300 Meter altitude difference



Key attributes on Performance

Brainstroming
5 min time



Sports Cars

Lap Time	Vehicle	Driver	Date
6:43.300	Porsche 991 GT2 RS Manthey Performance Kit	Lars Kern	14.06.2021
6:48.047	Mercedes-AMG GT Black Series	Maro Engel	04.11.2020
6:55.737	Porsche 911 GT3 Manthey Performance Kit	Kévin Estre	21.04.2022
6:59.93	Porsche 911 GT3	Lars Kern	15.09.2020
7:09.300	Porsche 718 Cayman GT4 RS	Jörg Bergmeister	17.09.2021

<https://nuerburgring.de>

Electric

Lap Time	Vehicle	Driver	Date
7:33.35	Porsche Taycan Turbo S	Lars Kern	11.04.2022
7:35.579	Tesla Model S Plaid	Andreas Simonsen	09.09.2021

<https://nuerburgring.de>

SUV

Lap Time	Vehicle	Driver	Date
7:38.925	Porsche Cayenne Turbo GT	Lars Kern	14.06.2021
7:42.253	Audi RS Q8	Frank Stippler	13.09.2019
7:54.40	Mercedes-AMG GLC 63 S 4MATIC+	Markus Hofbauer	06.11.2018

<https://nuerburgring.de>

Prototypes

Lap Time	Vehicle	Driver	Date
5:19.546	Porsche 919 Hybrid Evo	Timo Bernhard	29.06.2018
6:05.336	VW ID.R	Romain Dumans	03.06.2019
7:20.143	Lynk & Co 03 Cyan Concept	Thed Björk	19.08.2019

<https://nuerburgring.de>

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Automobiles / Product Concepts / Systems Engineering

Product concepts are the result of an ideation process as a first step within the innovation process



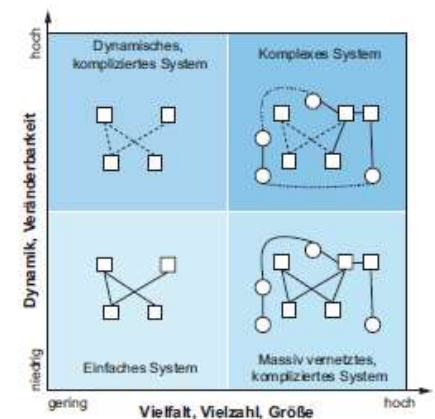
Automobiles are

- Machine based powered
- Self driven (automobile)
- Not rail mounted land crafts.*



* Further differentiation of the terminology see [Hak17]

Systems (e.g. powertrain, axles) are developed by using methods of „**Systems Engineering**“: design and specification of products with different areas of expertise. It is also applicable for services and production systems.



[GP14], [Hak17], [www.mercedes-amg.com]

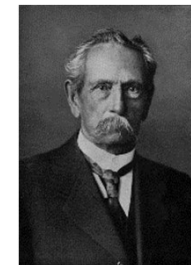
Why a product development process?

With the prediction of the future many (famous) people were wrong...

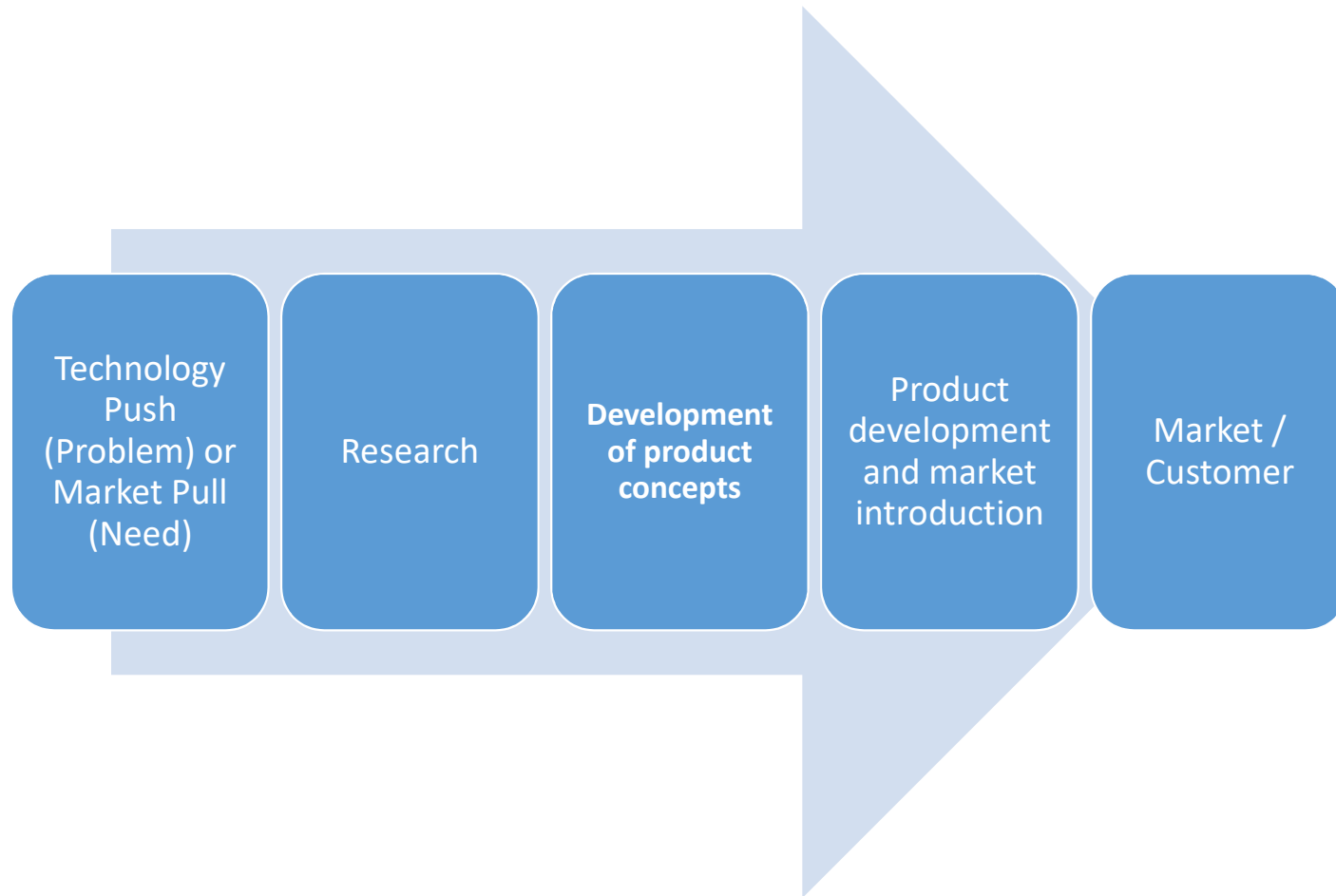


„The development of the automobile is finished. There is not more to expect?“

Carl Benz (1844-1929) year 1920.



Process based classification of vehicle concepts



[BBB+17]

Detailed Processes within product development and market introduction



Abb. 4.10 Forschung

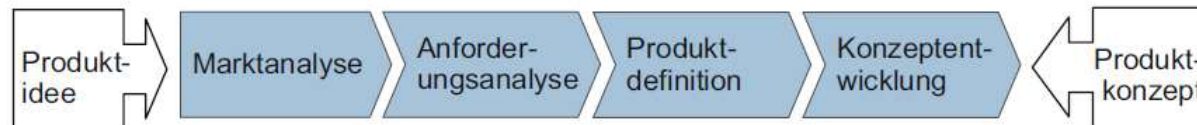


Abb. 4.11 Produktkonzeption

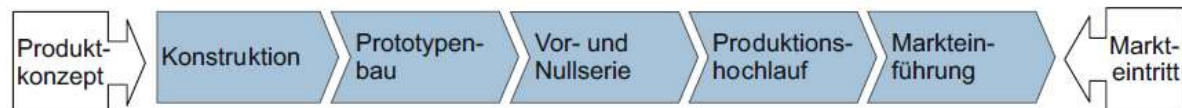


Abb. 4.12 Produktentwicklung und Markteinführung

[BBB+17]

Types of Innovations

- Performance-Innovations (Products or Services)
- Process-Innovations (Manufacturing process of products and services)
- Market-Innovations (Development of new or existing markets)
- Social-Innovations (e.g. Human Resources, Organizational, Legal)

	Bestehendes Produktkonzept bestätigt	Bestehendes Produktkonzept verworfen
Unveränderte Verknüpfung (Prod.-komponenten)	Inkrementale Innovation (z.B. Leistungssteigerung des bestehenden Antriebskonzepts)	Modulare Innovation (z.B. Neue Funktion und Materialität des Dachs von Cabrio-Fahrzeugen)
Veränderte Verknüpfung (Prod.-komponenten)	Architekturelle Innovation (z.B. Automobil mit Brennstoffzellenantrieb)	Radikale Innovation (z.B. Autonom fahrendes Fahrzeug)

	Technische Innovation	Sozial-technische Innovation
Produktinnovation	Fahrzeug mit Hybridantrieb	SUV Coupé (z.B. Mercedes-Benz GLE Coupé)
Prozessinnovation	3D Konfigurator am Point of Sales	Fahrzeugabholung im Werk

[Soe16]

Classification of Technologies

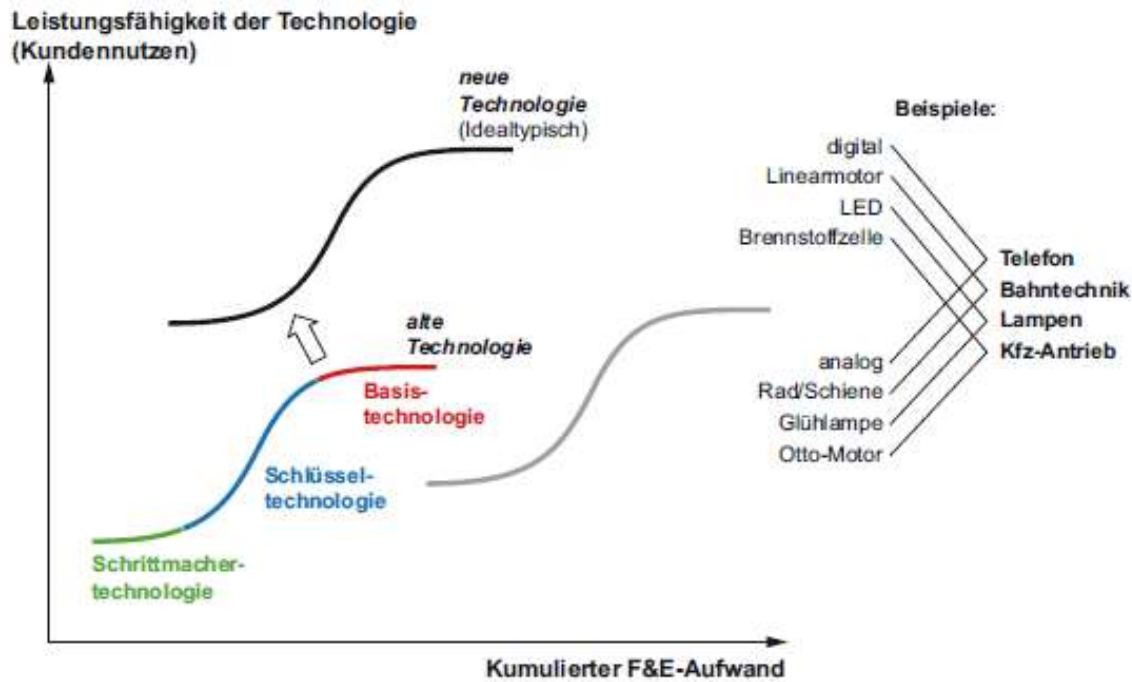
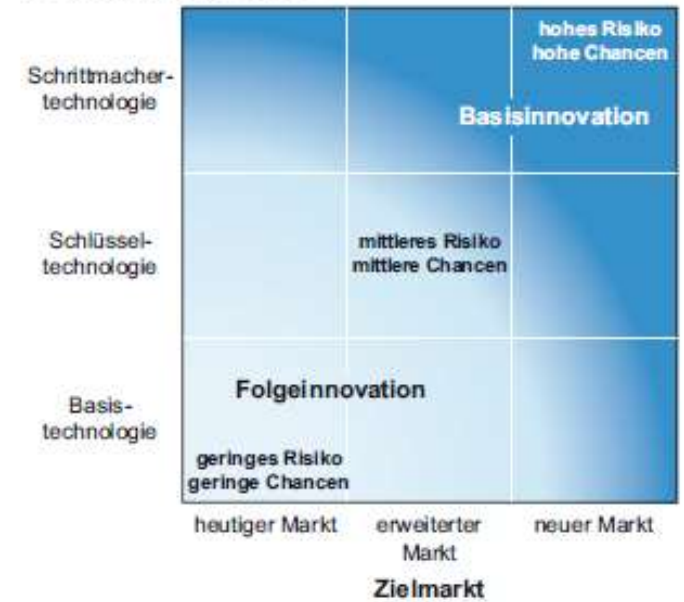


BILD 1.7 S-Kurve der Technologieentwicklung nach McKinsey

Position auf der S-Kurve



[GDP+19], [Soe16]

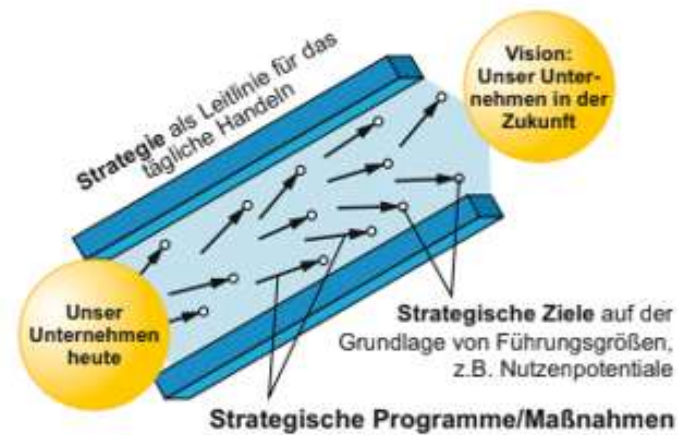
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What is strategy?

“a plan of action designed to achieve a long-term or overall aim”

Eine **Strategie** kann als
„Leitlinie für das tägliche Handeln“ verstanden werden.

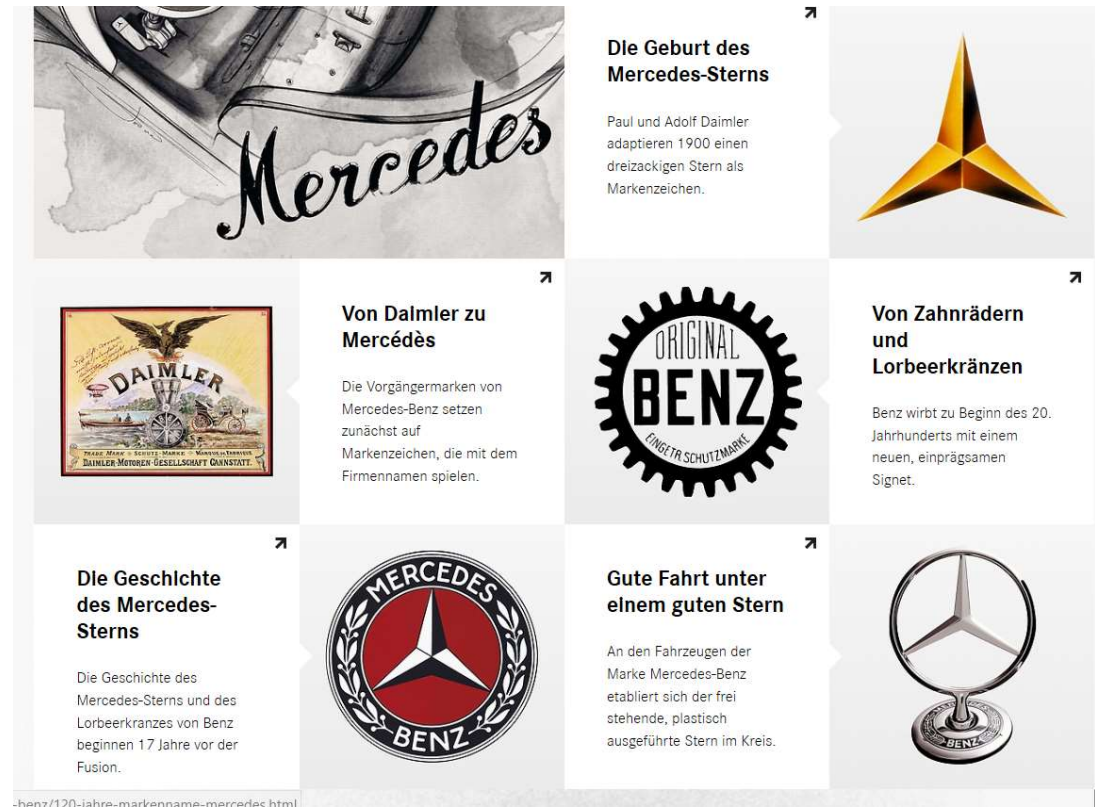


[GP14]

It begins with a vision: Example Mercedes-AMG



And the brand evolves based on future visions. Example: Mercedes-Benz

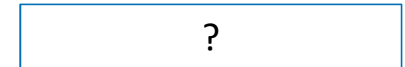


[www.daimler.com]

Example: Mercedes-AMG



[Driving Performance](#)

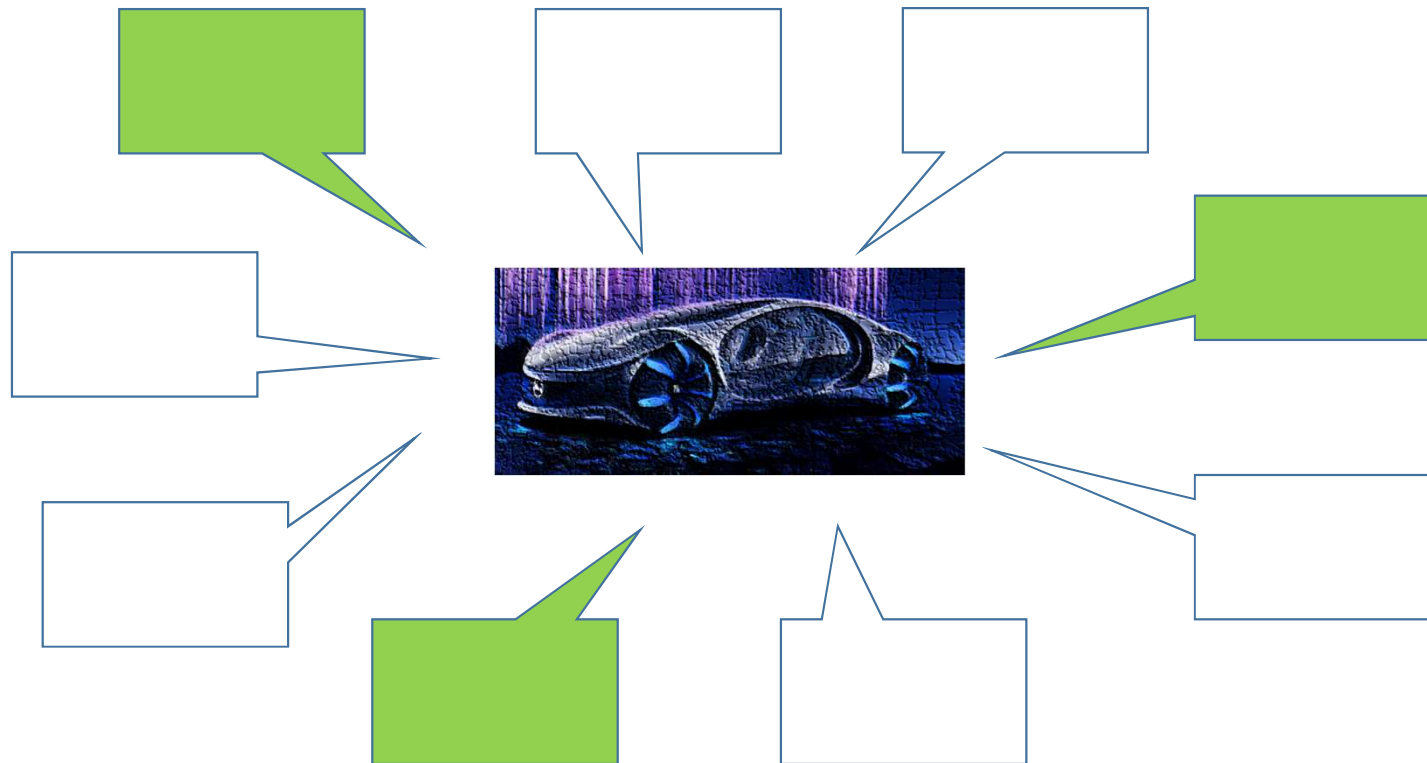


[Future Performance](#)

[www.mercedes-amg.com]

What advantages gives your product concept to the customer?

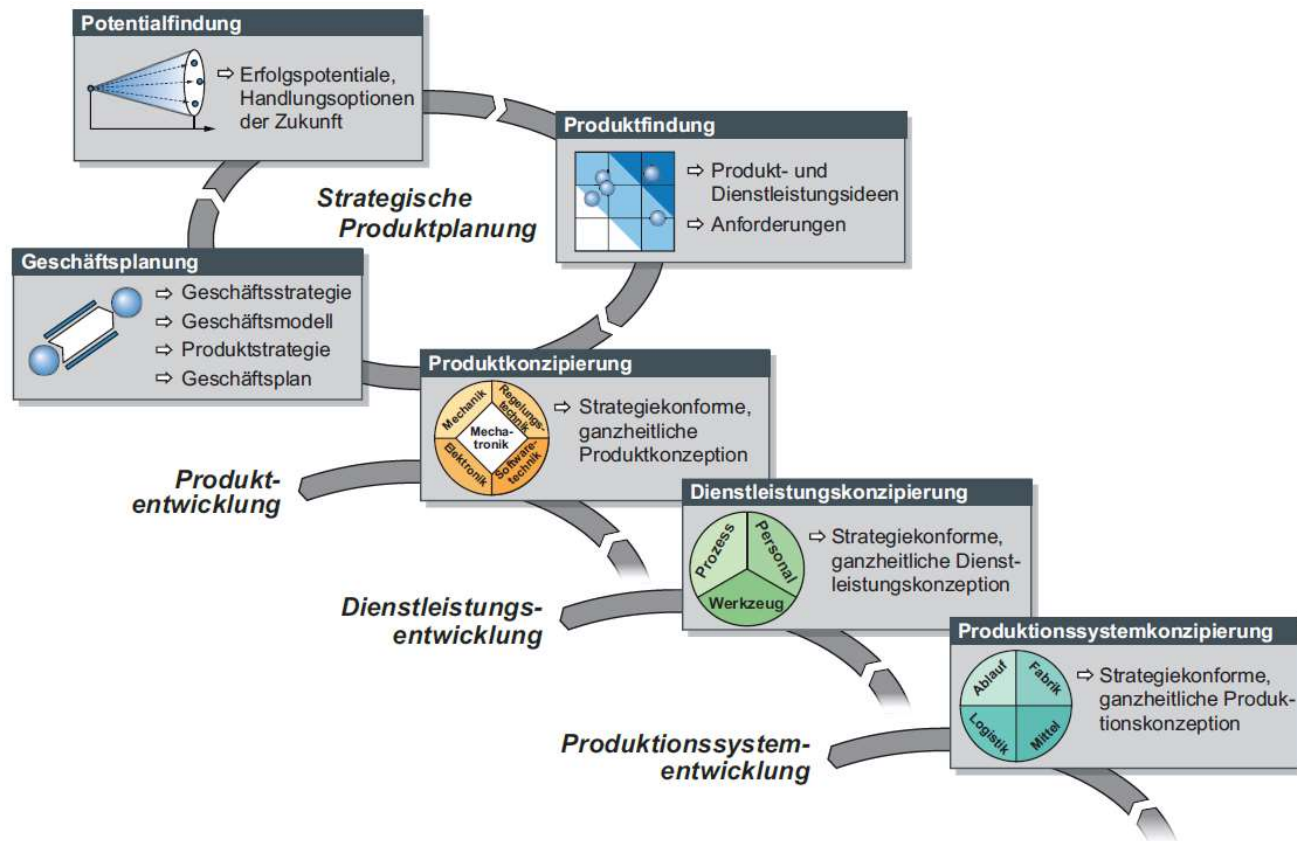
Brainstroming
5 min time



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How products and product concepts are developed: Example: The reference model of product development [GAUSEMEIER]



[GDP+19]

Subject areas of the lecture

Module 1

Strategy & Product Development

Module 2

Systems Engineering of mechatronics (Hardware / Software)

Module 3

Basics & parameters of a vehicle concept

Module 4

Practical Experience – test track Memmingen

Module 5

Description of environmental scenarios

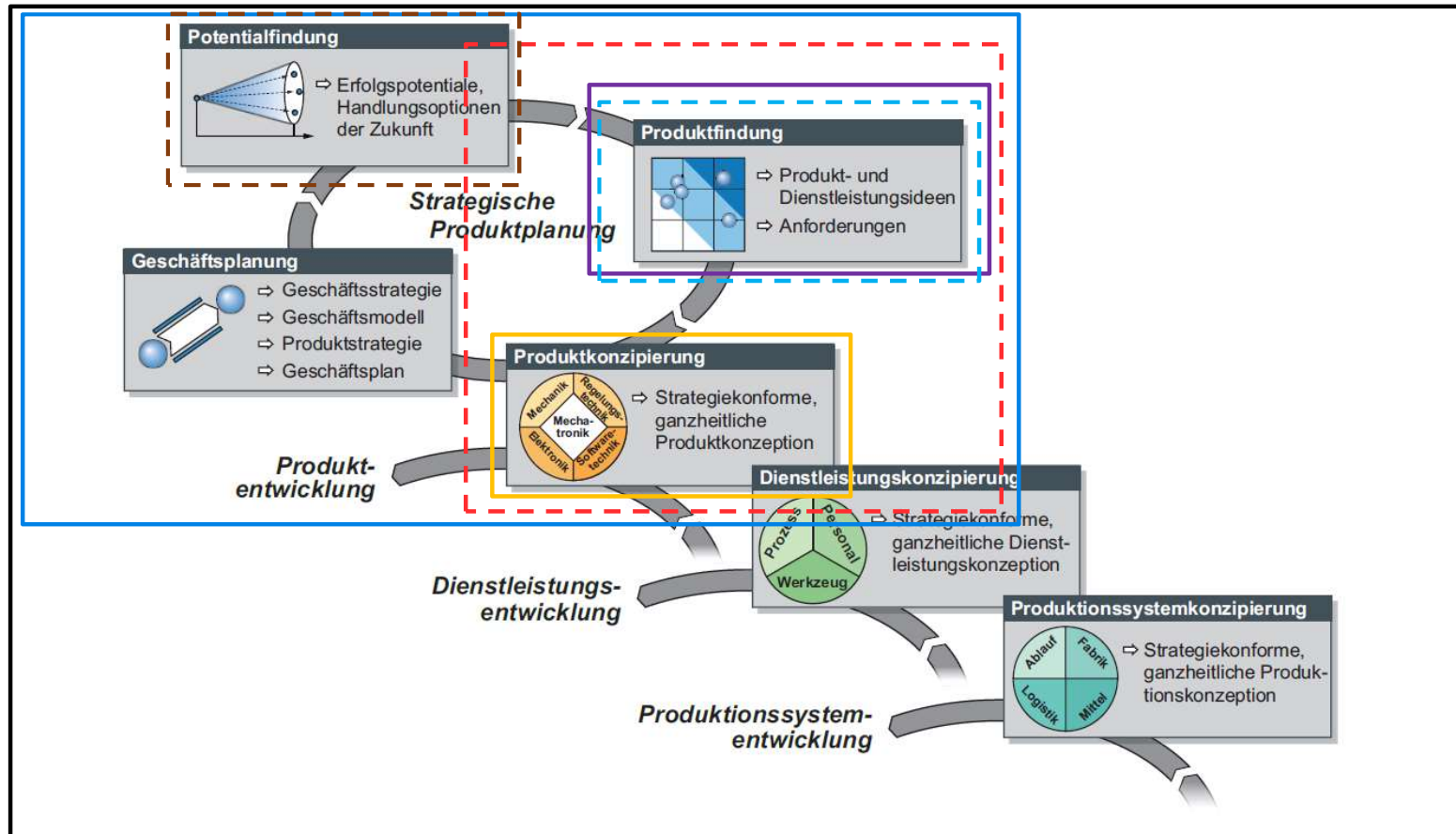
Module 6

Planning and evaluating vehicle concepts

Module 7

Organization, Leadership & Management: „Engineering is teamwork & people business“

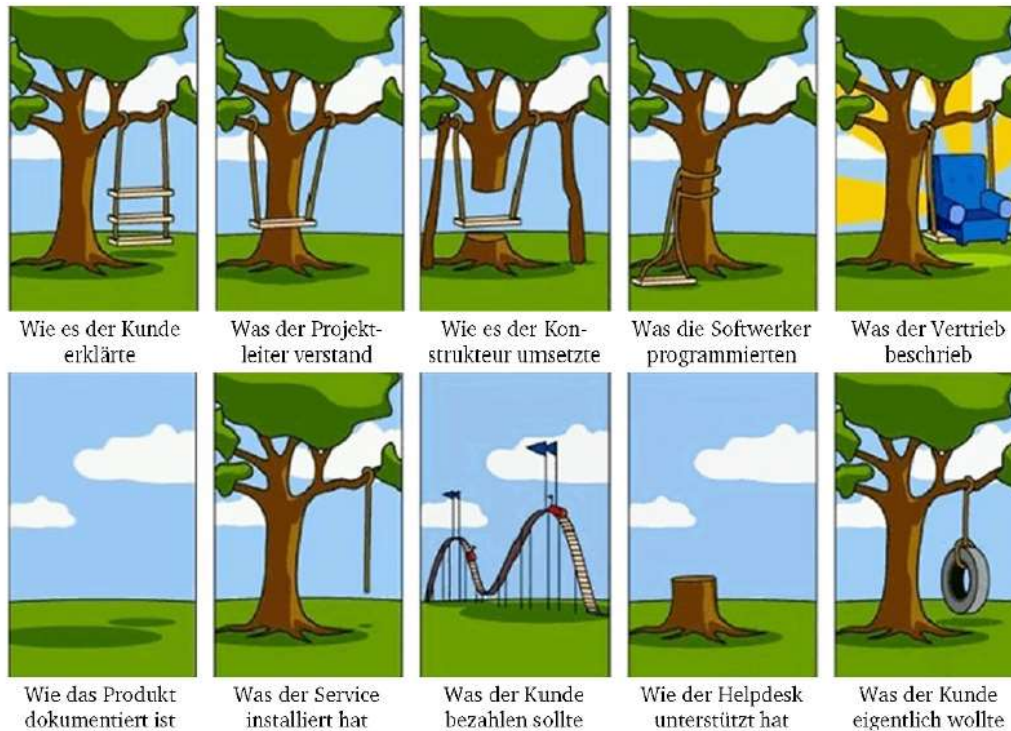
Subject areas in the reference model of the strategic planning [GAUSEMEIER]



[GDP+19]

Models to evaluate product requirements.

Different understandings of „requirements“.



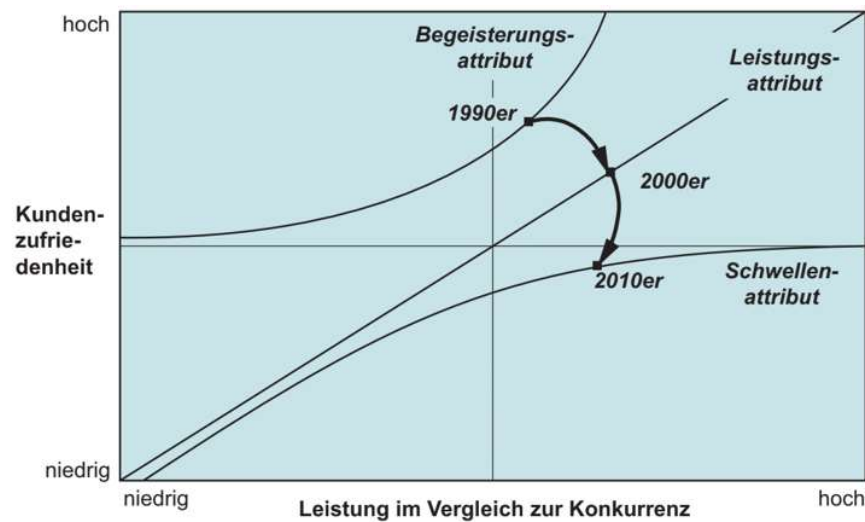
Info:
The other way around means
=> Reverse Engineering

[Kir20]

Model to evaluate product attributes (KANO)

Homework

- From Enthusiasm to basic => Fahrerassistenzsysteme



A further method is the Conjoint Analysis, see also: [GDP+19, S. 107ff.]

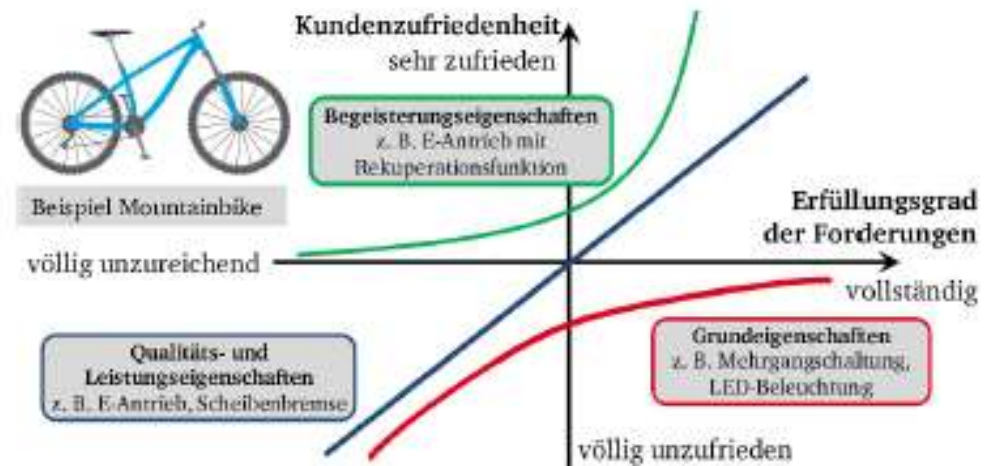


Abb. 3.26 Kano Modell am Beispiel eines Fahrrades

[GEK01], [Kir20]

Conflict goals of different requirements => You can not have it all

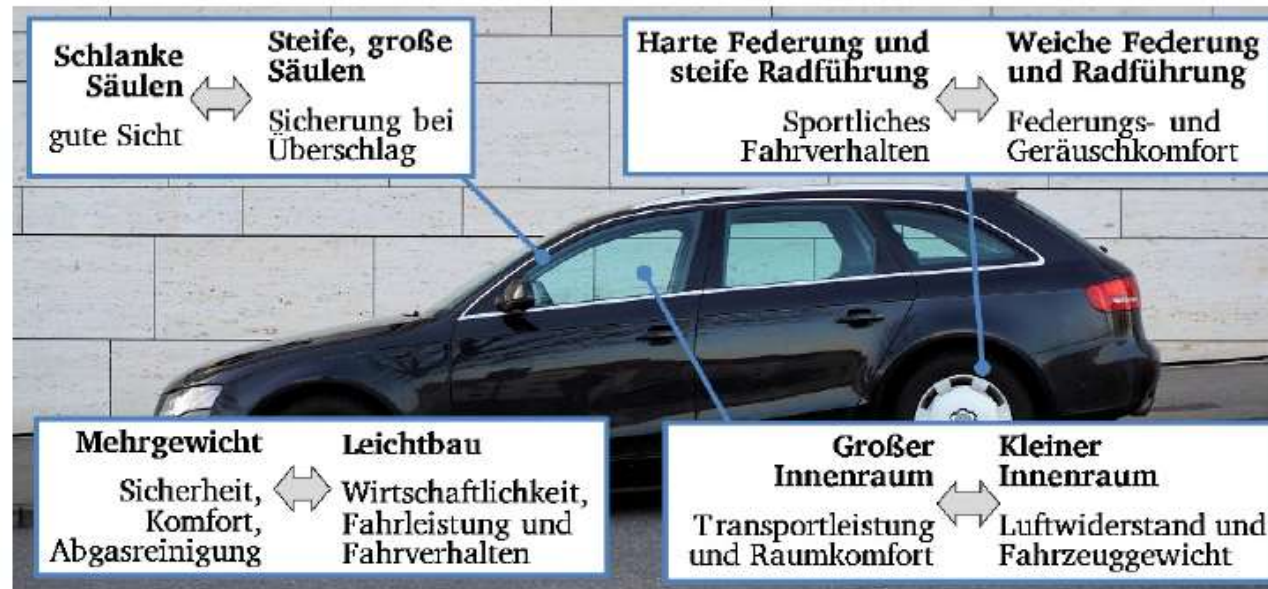
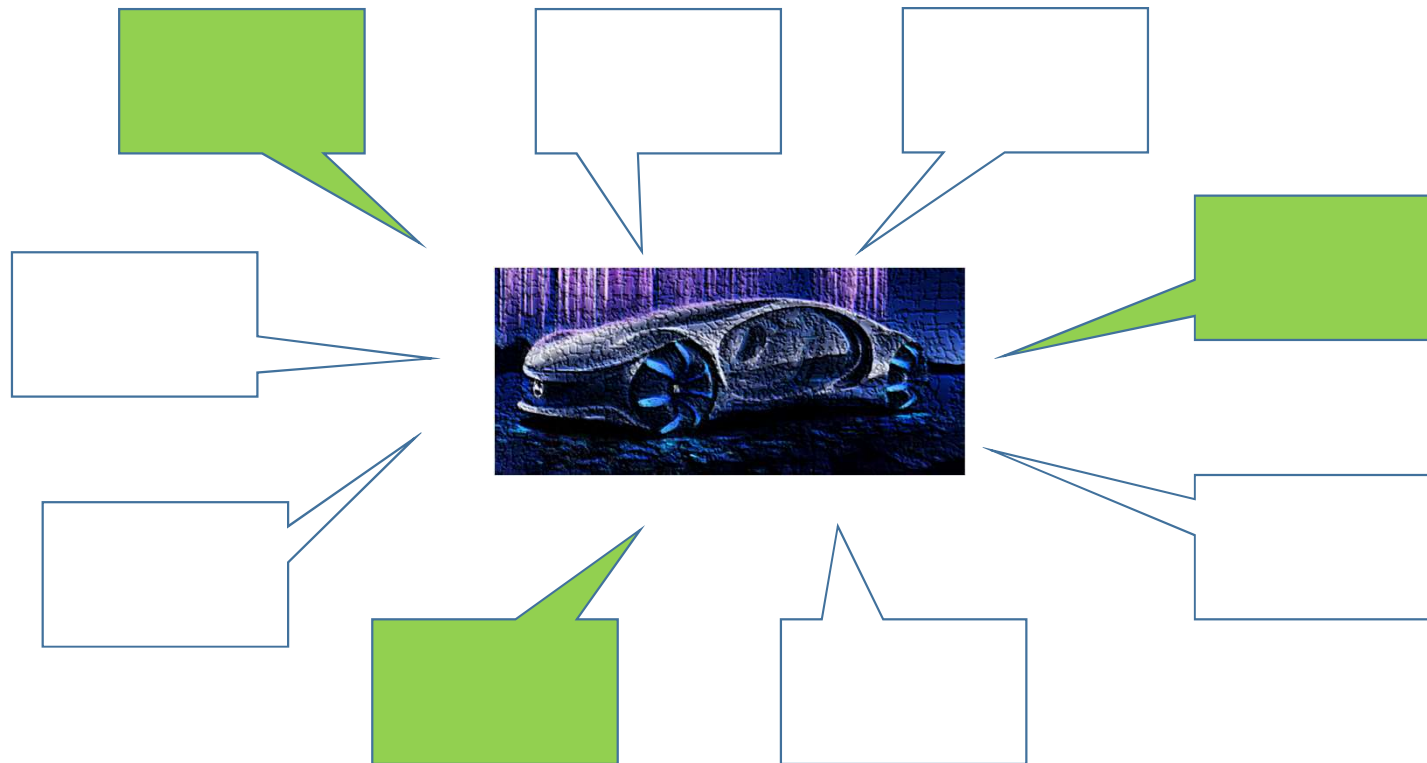


Abb. 3.28 Beispielhafte Zielkonflikte aus Anforderungen

[Kir20], [AMG interne Präsentation]

What conflicting goals are you facing?

Homework



Standardization vs. Differentiation

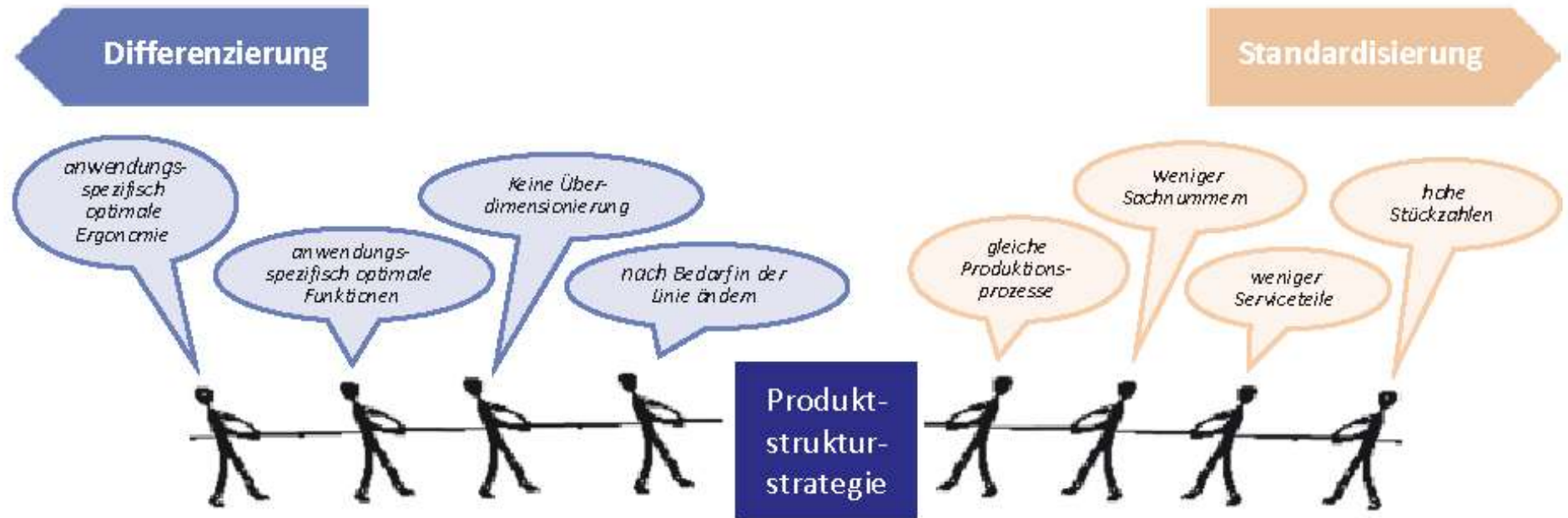


Abb. 4.18 Zielkonflikt zwischen Standardisierung und Differenzierung (Eilmus 2016)

[KB18]

Platforms & modules

Example: Volkswagen

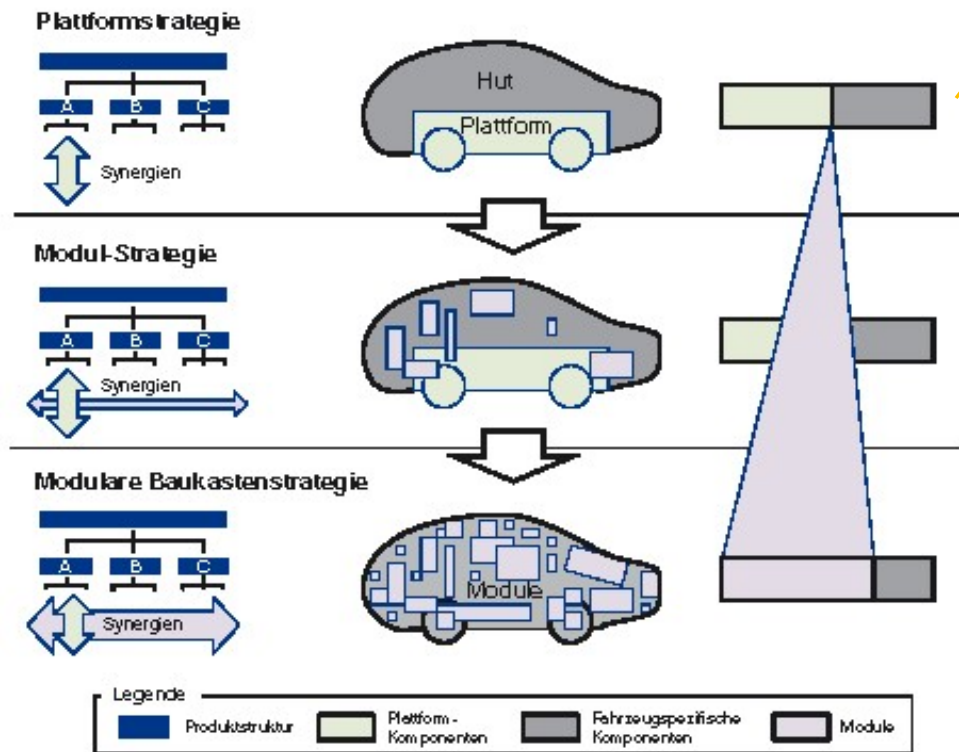
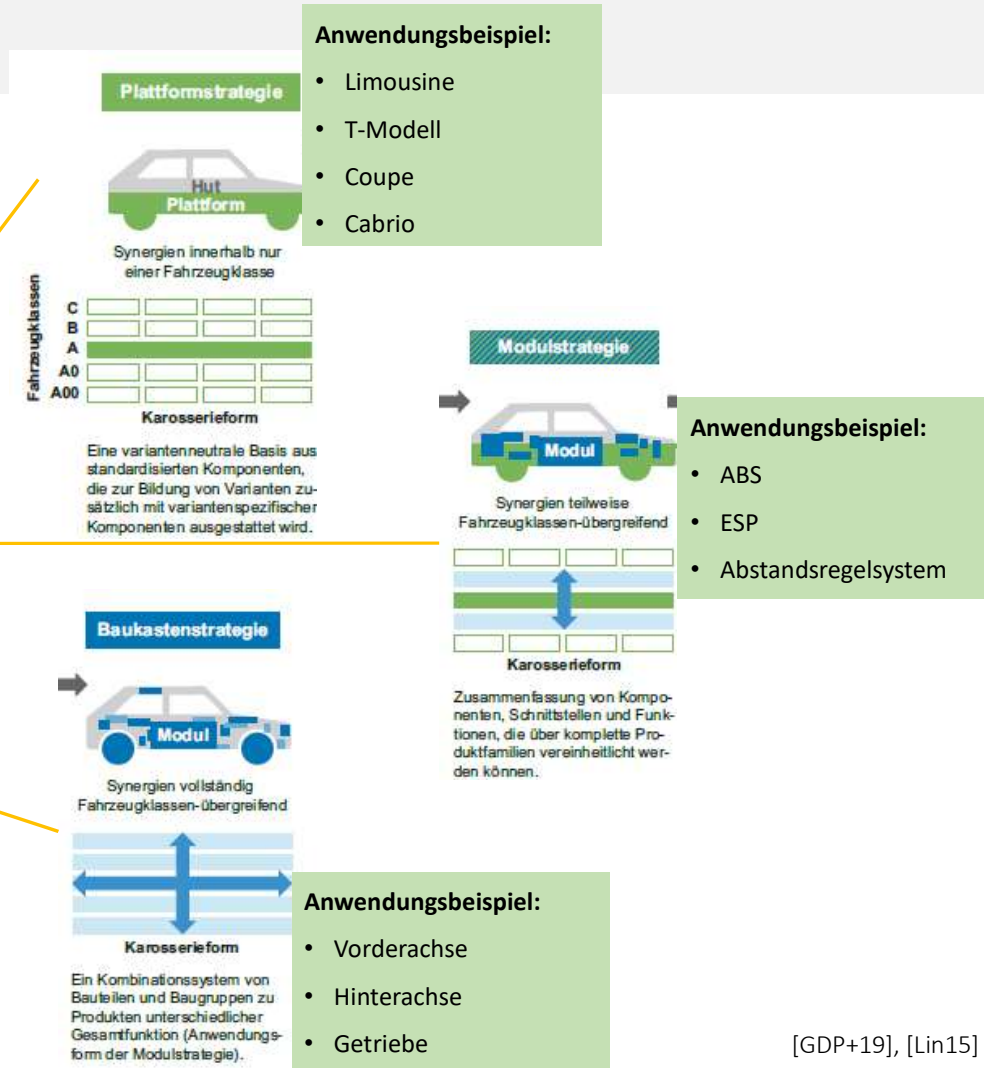


Bild 6.26 Plattform- und Modulstrategie bei Volkswagen, in Anlehnung an (Volkswagen AG 2011)



[GDP+19], [Lin15]

Teamwork – Parameters of your vehicle concept

- Please describe your product concept regarding influence factors & key attributes regarding the whole vehicle / modules & functions
 - What technical features (attributes) do you think of? (=> please use the KANO model)
 - Can you identify conflicting goals?
 - What promise do you give to the market with the product?
 - Are you planning platform variants? If yes, what kind of?
- Please create a powerpoint presentation you can build on in the next sessions
- Please upload our presentation (Moodle, [FT21_FKS WS22/23: Teamwork - Parameters of your vehicle concept \(hs-kempten.de\)](#))

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