



Digital Transformation in the Automotive Industry

Digitale Transformation in der Automobilindustrie

Dr. Michael Nolting
Lecture 1



Short introduction

- 2007: Studied Computer Science (M.Sc.) and Electrical Engineering (Dipl. Ing.)

2010: PhD at the Department of Systems Engineering LUH (Dr.-Ing.)

2011: First job at Volkswagen Research

2014: Joined Sevenval as Head of Big Data Analytics in Berlin

Since 2016 at Volkswagen Commercial Vehicles: Head of Digital Services & Data Analytics (Abteilungsleiter) / headcount: 100 p.

Blog michaelnolting.com & founder of foodplaner.de

For general information and questions reach out via nolting@kbs.uni-hannover.de

PS: I am giving this lecture without compensation – just for fun 😊

Dr. Michael Nolting





General information regarding the lecture

General information:

- Registration via StudIP / 3 credits
- 14 weeks a 2 SWS (90min) = 1260 min
 - 11 lectures a 60 min = 660 min
 - 10 homeworks with an estimated effort of 60 min = 600 min
- Lecture notes are in English
- Audio stream is in German (from 2022) and maybe in English starting 2023
- Live-presentation is in German

Exam:

- Exam will be oral in German or English
- Only the core lectures (and not the homework) will be relevant for the exam

Legal notice:

- All materials and sources provided may include copyrighted third party materials. Please do not re-distribute these notes!

Tutorials

- Homework will be reading the book from Gene Kim „The Phoenix Project“

The homeworks are optional and not relevant for the exam



Lecture Overview

1. Introduction: Why Digital & Data Transformation	7. Culture & Organization
Homework 1: Reading 60 mins the Phoenix Project	Homework 7: Reading 60 mins the Phoenix Project
2. The World is Changing: ACES & VUCA	8. Examples of Digitalization Projects I
Homework 2: Reading 60 mins the Phoenix Project	Homework 8: Reading 60 mins the Phoenix Project
3. The Technological Disruption I	9. Examples of Digitalization Projects II
Homework 3: Reading 60 mins the Phoenix Project	Homework 9: Reading 60 mins the Phoenix Project
4. The Technological Disruption II	10. TESLA as THE Digital Player
Homework 4: Reading 60 mins the Phoenix Project	Homework 10: Reading 60 mins the Phoenix Project
5. Common Challenges for the Transformation	11. Q & A – Exam
Homework 5: Reading 60 mins the Phoenix Project	
6. Vision to Become a Techgiant	
Homework 6: Reading 60 mins the Phoenix Project	

Agenda

01

Introduction

02

Why Digital & Data Transformation

03

Outlook

04

Summary

Agenda

01

Introduction

02

Why Digital & Data Transformation

03

Outlook

04

Summary

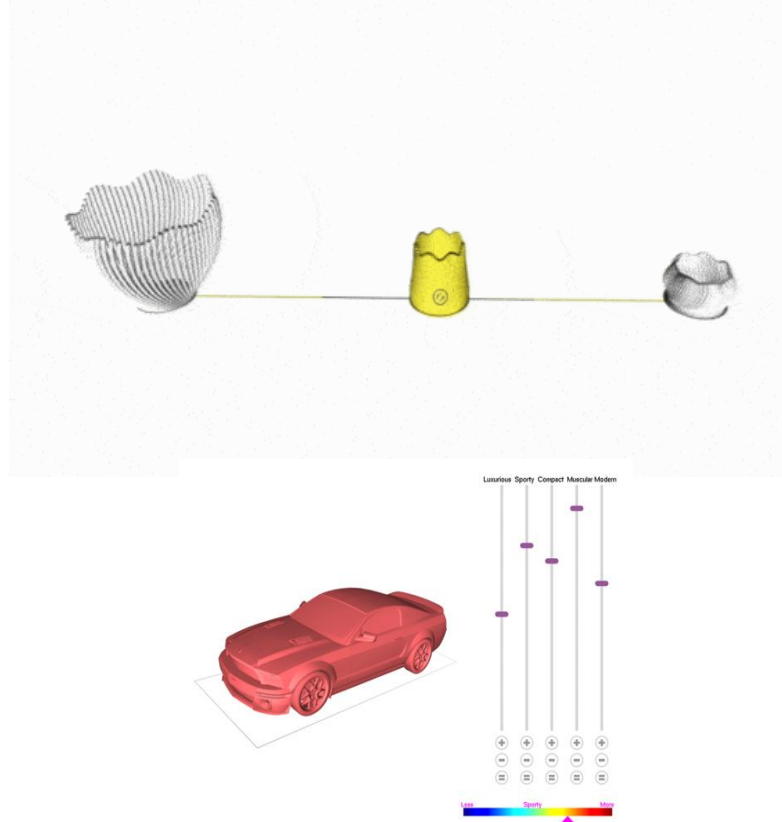
AI Will Flood our World with new Things

“No Man’s Sky” with 18 quintillions of planets

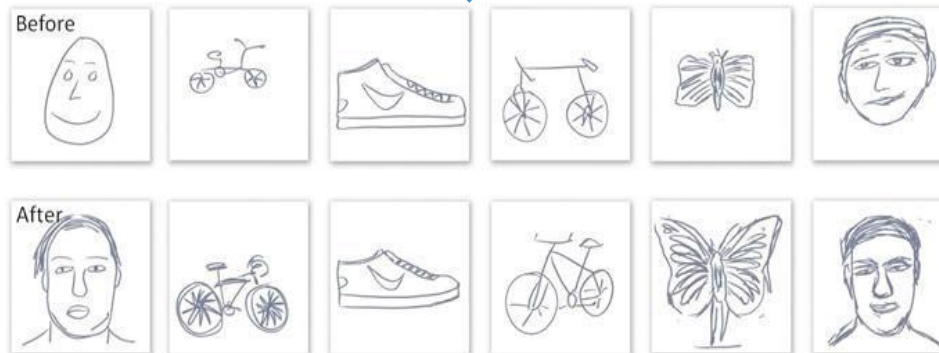
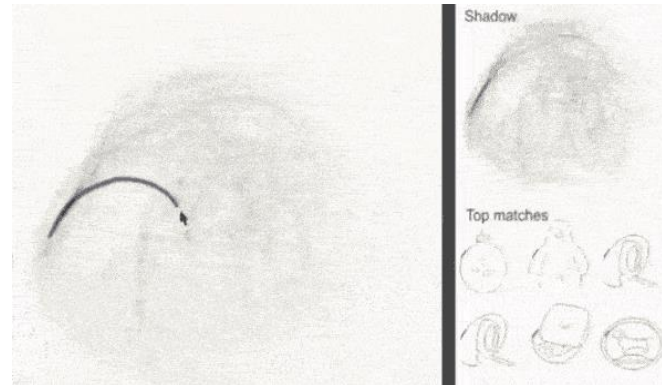


Source: https://en.wikipedia.org/wiki/Development_of_No_Man%27s_Sky

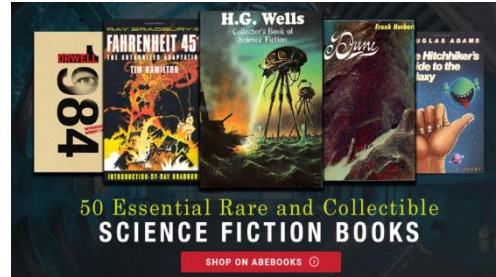
Our world will get an infinite amount of flavours:
How many numbers are between 0 and 1?



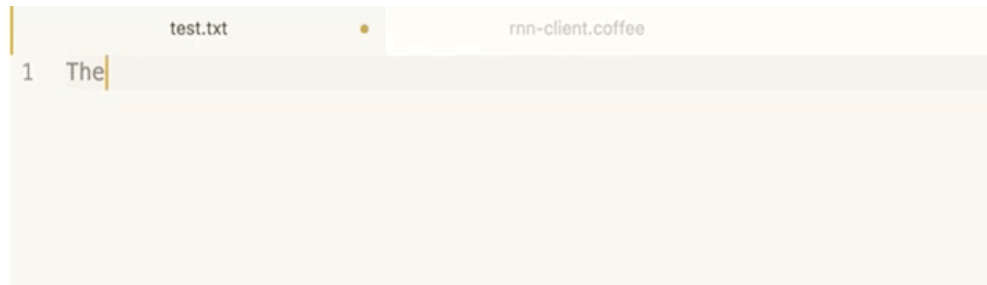
Assisted Freehand Drawing (2011)



Assisted Writing (2016)



http://from.robinsloan.com/rnn-writer/ia_scifi.zip (150



GPT-3 is a Game Changer



13



Dr. Michael Nolting



Starting with the Climate Crisis...



Ukraine-Krieg

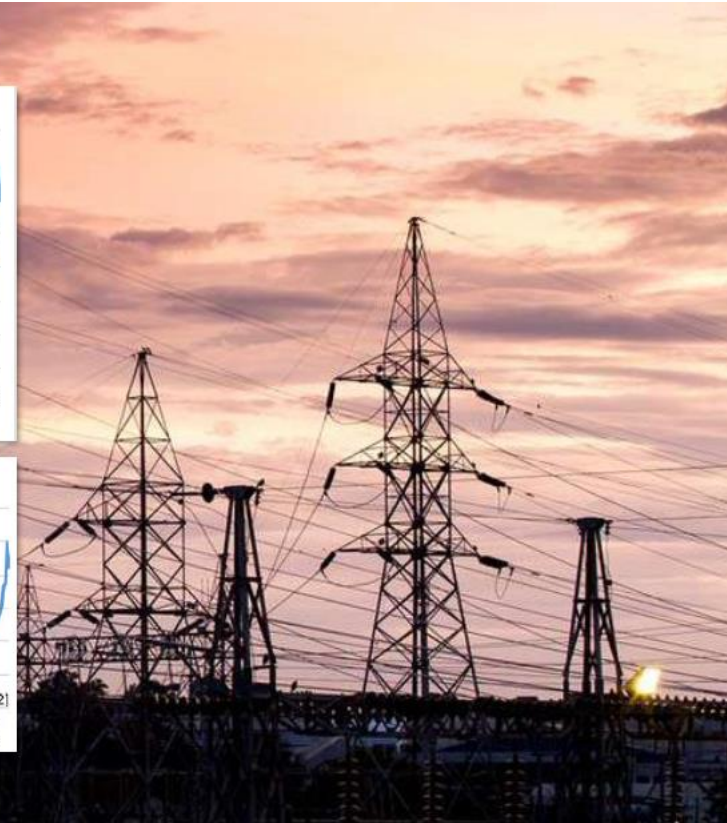
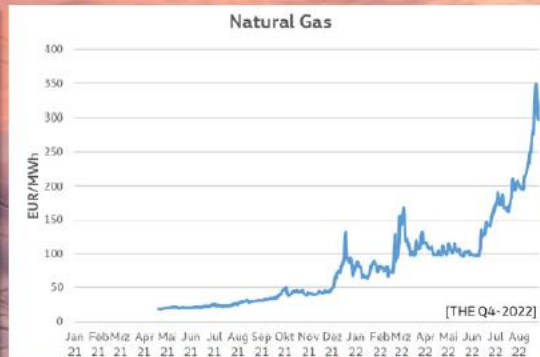
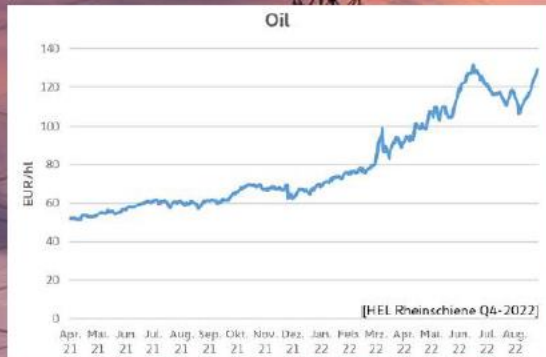


**Halbleitersituation,
Energieversorgung &
Rohstoffmarkt**



COVID Situation

... and finally: “Hello, Energy Crisis!”



ACES: A Smartphone on 4 Wheels



A – Autonomous Driving



C – Connectivity



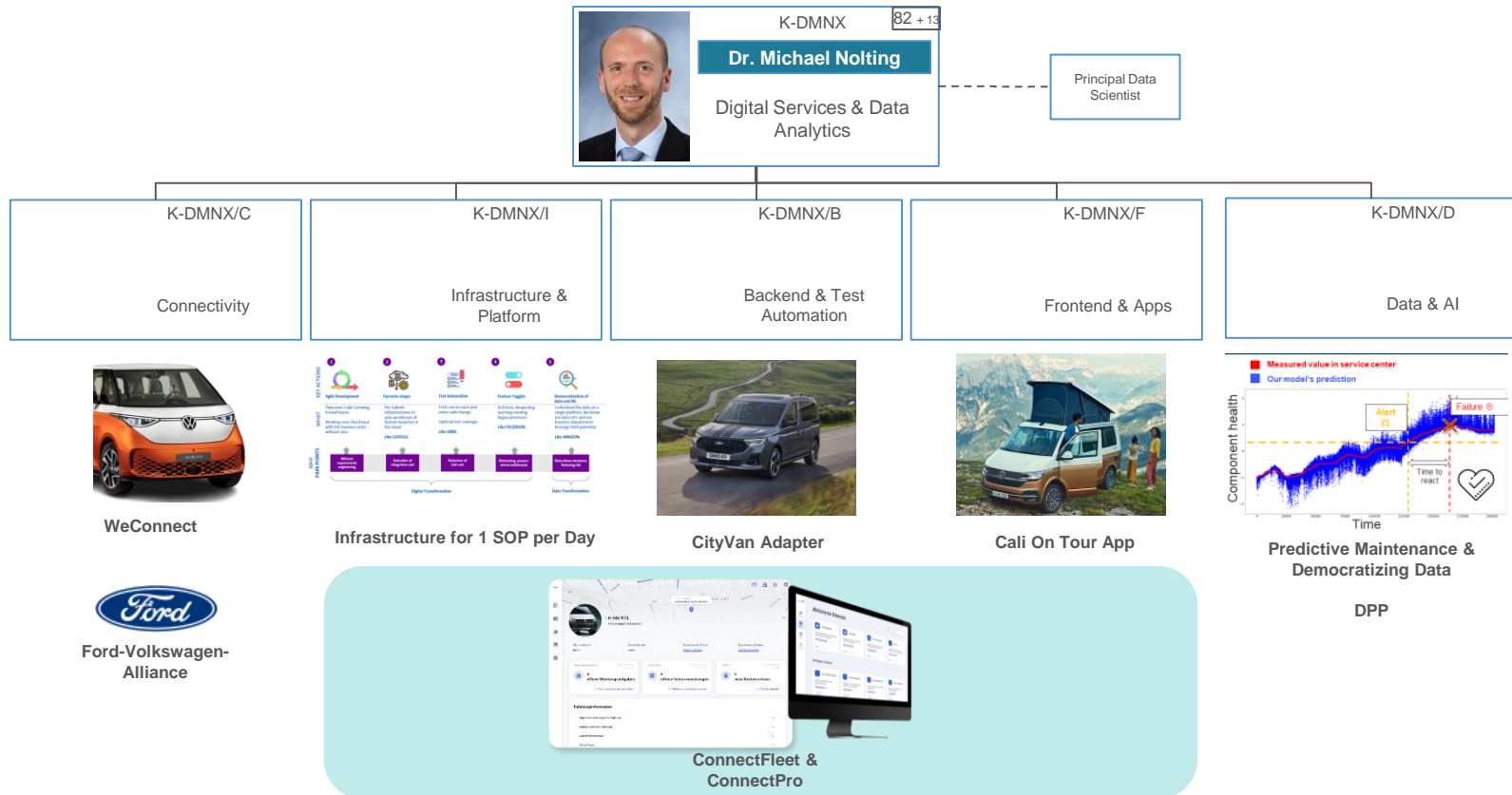
E – Electrification



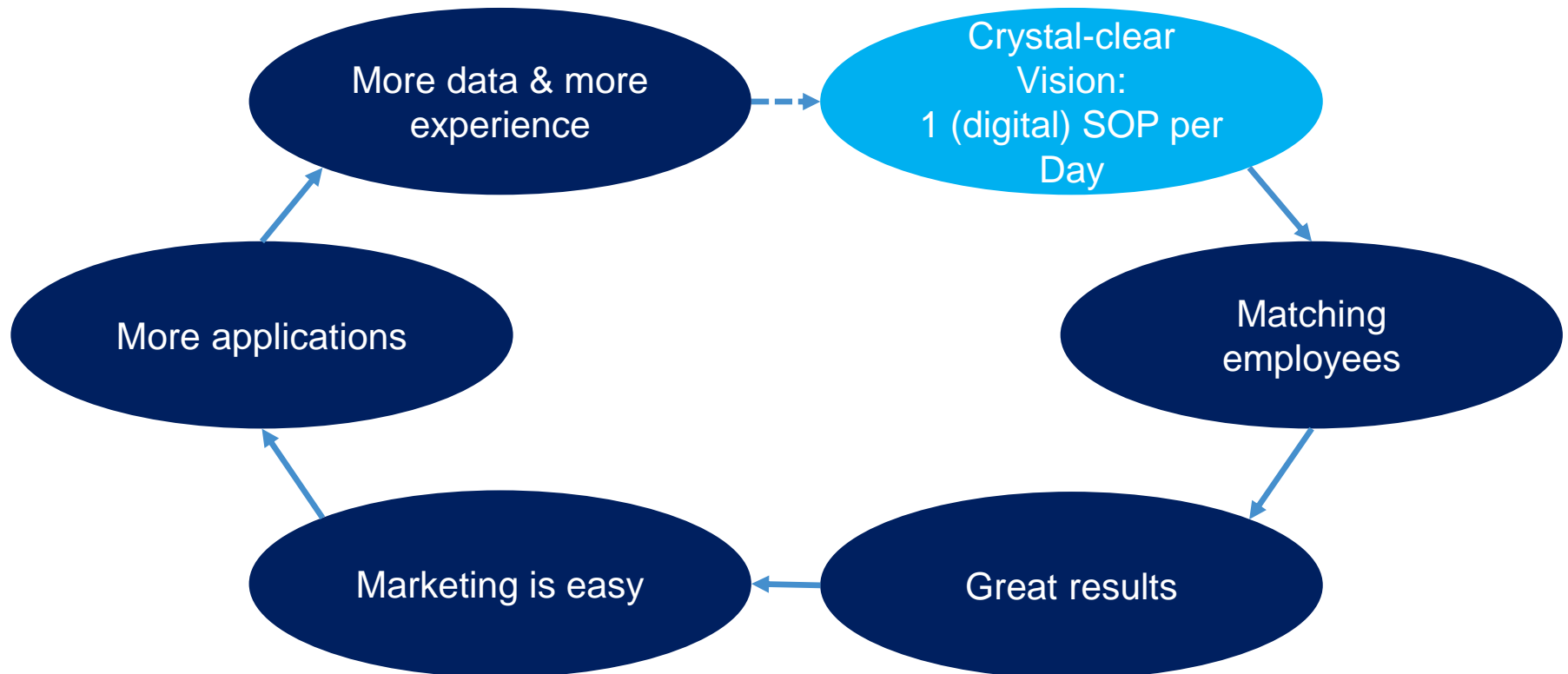
S – Shared Mobility

Source: "The Car – A Computer on Wheels", Keynote ICSE 2018, Ödgård Andersson
<https://www.icse2018.org/getImage/orig/The+Car+%E2%80%93+computer+on+wheels.pdf>

K-DMNX – 60 Percent of the Team are Developers



The Secret Formula of our fast Growth: **Data-driven Recruiting**





MOD
PROJEKTHAUS



On Eye-Level with the Business

Almost 100 people sharing the same mindset of modern software development!

We develop customer-centric, scalable and robust mobile online services for thousands of commercial customers; and transform VWCV into a data-driven company.

I. Design & Development

We work very close with the business departments and are co-located. We develop digital services for B2C- and B2B-markets.

Cross-functional

We work in cross-functional teams and leverage modern agile frameworks such as SCRUM, SAFe, LEAN etc.

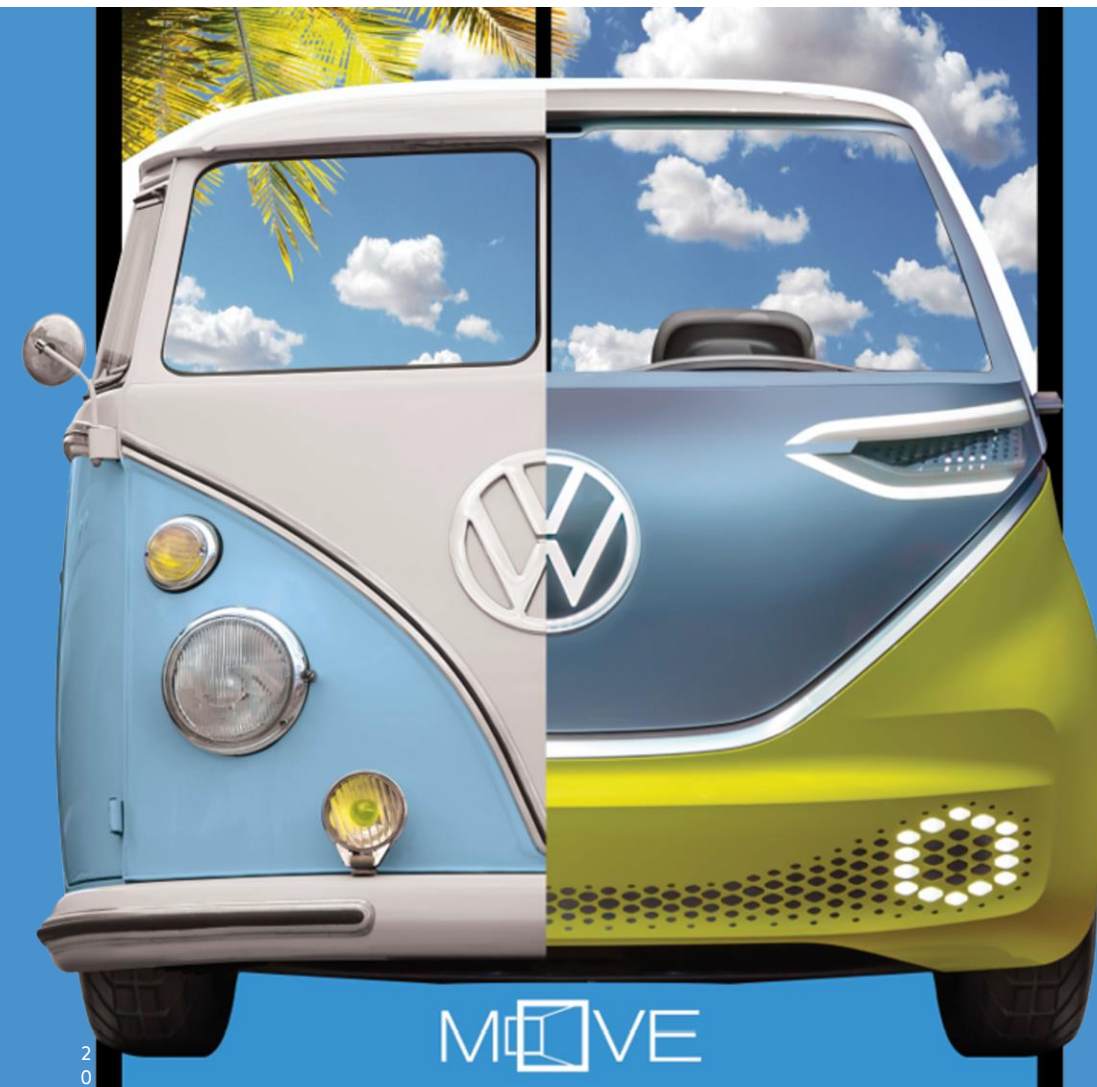
However, what really matters is output.

III. Think like a Start-Up, act like a Grown-Up

We act fast. If we make failures, we learn from them. We are not afraid of making failures. We share and do not hide failures. We comply to the corporate processes.

IV. Continuous improvement & customer obsession

Continuous improvement is in our DNA. We are customer obsessed and are a core-cell of the ongoing transformation of Volkswagen.



Biggest Transformation in the History of the Brand



Nutzfahrzeuge



Commercial customers are different from B2C-customers: Strong B2B focus, small quantities BUT high profits



Fleets: Commercial vehicles are usually bundled in fleets



Uptime: Uptime is key for commercial customers



Willingness to pay: Commercial customer are willing to pay for services, which eases their daily lives



B2B readiness: Digital services need to be B2B ready



Long-tail: cars are used in various application scenarios and adapted to their needs (e.g. police cars etc.)



Data usage: Car user is not car owner, specific requirements regarding consent management



Retailer as a Touchpoint: Customer often are stronger connected to the retailer



B2C customers with diverse requirements: **Camping, Family, Hobby...**



Specific requirements for „Jobs to be done“ for relatively small volumes.

Conclusion: We have to be very customer-centric and cost-efficient to master the transformation!



We Transport
Success,



Freedom



and Future



22



Dr. Michael Nolting





We Transport Success



We Transport Freedom



HINTERLAND



Autonomous Ridepooling

We Transport Future



Changing mobility
as we know it



New ways of
transportation



Autonomous
Driving



Volkswagen Nutzfahrzeuges GRIP 2030 Strategie



<https://logistra.de/news/nfz-fuhrpark-lagerlogistik-intralogistik-vw-nutzfahrzeuge-elektrostrategie-von-eins-auf-55-prozent-acht-jahren-141185.html>

THE NEW AUTO STRATEGY



<https://www.volkswagenag.com/en/strategy.html#>

Agenda

01

Introduction

02

Why Digital & Data Transformation

03

Outlook

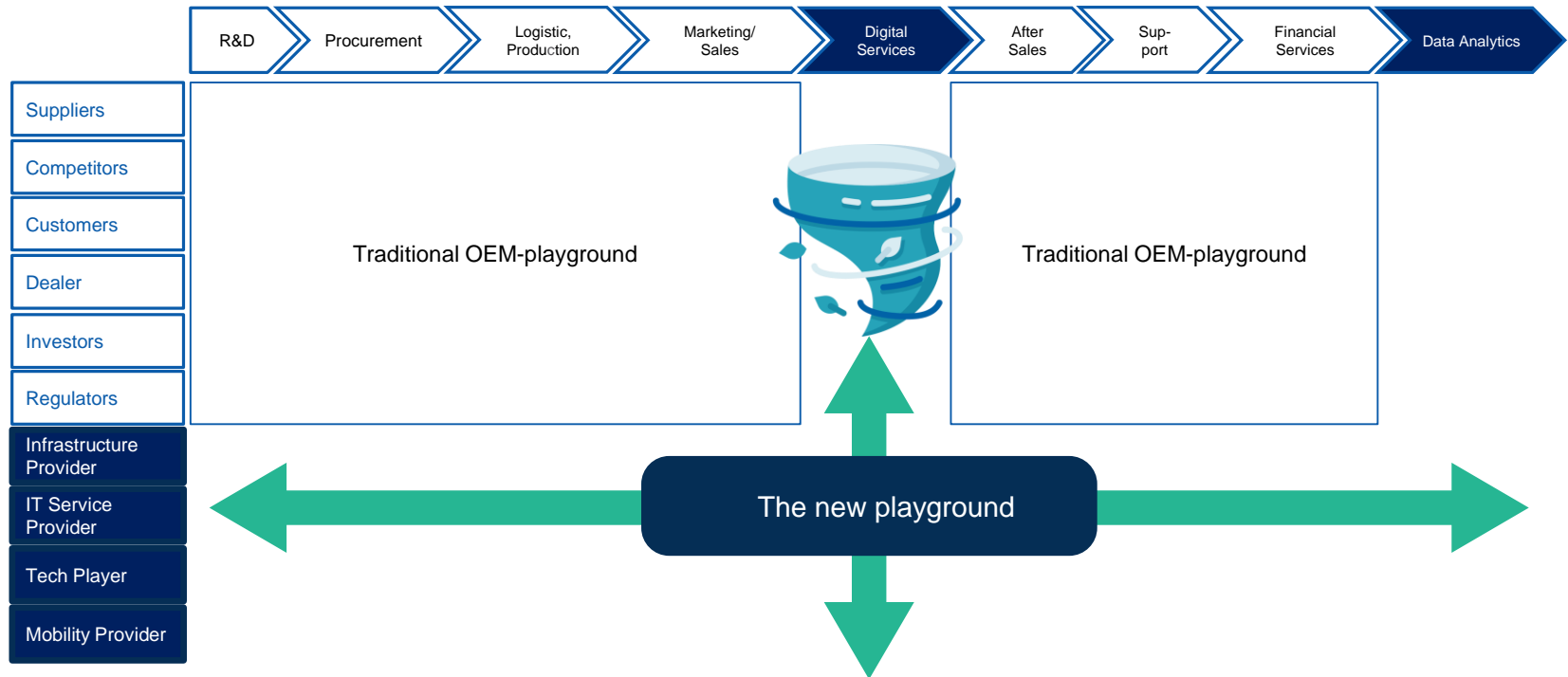
04

Summary

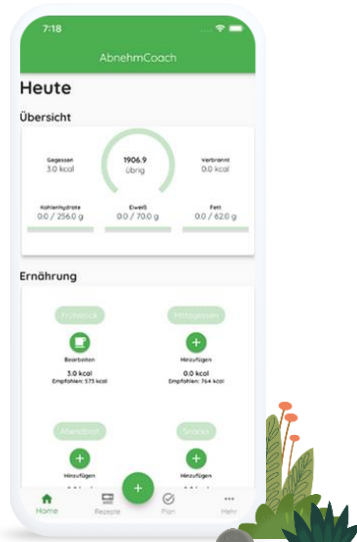
ID.BUZZ: The Answer of the Tomorrow's Demands



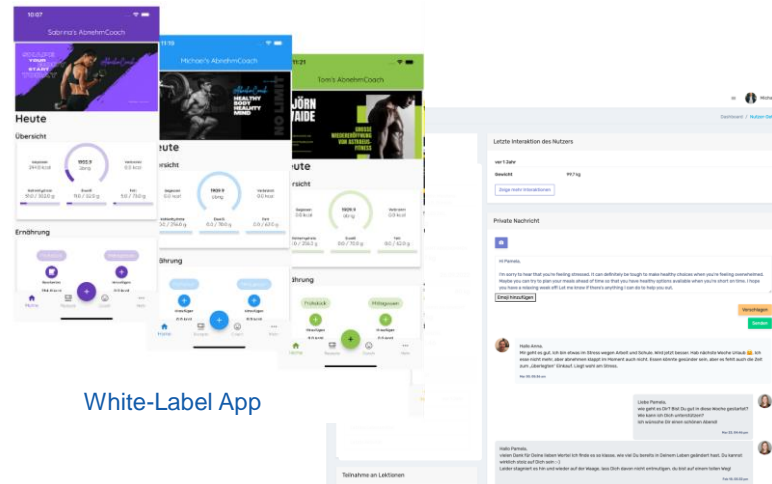
Disruption in the Automotive Value Chain



But How Strong is This Disruption?



B2C
Food journaling App



White-Label App
Trainer dashboard
B2B
AI-powered White-Label App for Personal Trainers

My personal “Aha!” moment in the trainer dashboard



Translated by me (originally in German)

“Hello Anna,

I’m fine. I am stressed due to work and school. It’s getting better and better though. I’m on vacation next week 😊 I’m not even eating more than I should, but I’m not losing weight either. I could eat healthier, but I don’t have the time to do any real grocery shopping. It’s probably the stress.”



Incredible response from GPT-3
(Needed only 10 lines of PHP code)

“Hi Pamela,

I’m sorry to hear that you’re feeling stressed. It can definitely be tough to make healthy choices when you’re feeling overwhelmed.

Maybe you can try to plan your meals ahead of time so that you have healthy options available when you’re short on time.

I hope you have a relaxing week off! Let me know if there’s anything I can do to help you out.

Anna”



Hallo Anna,

Mir geht es gut. Ich bin etwas im Stress wegen Arbeit und Schule. Wird jetzt besser. Habe nächste Woche Urlaub 😊. Ich esse nicht mehr, aber abnehmen klappt im Moment auch nicht. Essen könnte gesünder sein, aber es fehlt auch die Zeit zum „Überlegen“ Einkauf. Liegt wohl am Stress.

Mit 30.05.2022 um



Liebe Pamela,

Wie geht es Dir? Bist Du gut in diese Woche gestartet? Wie kann ich Dich unterstützen? Ich wünsche Dir einen schönen Abend!

Mit 25.05.2022 um



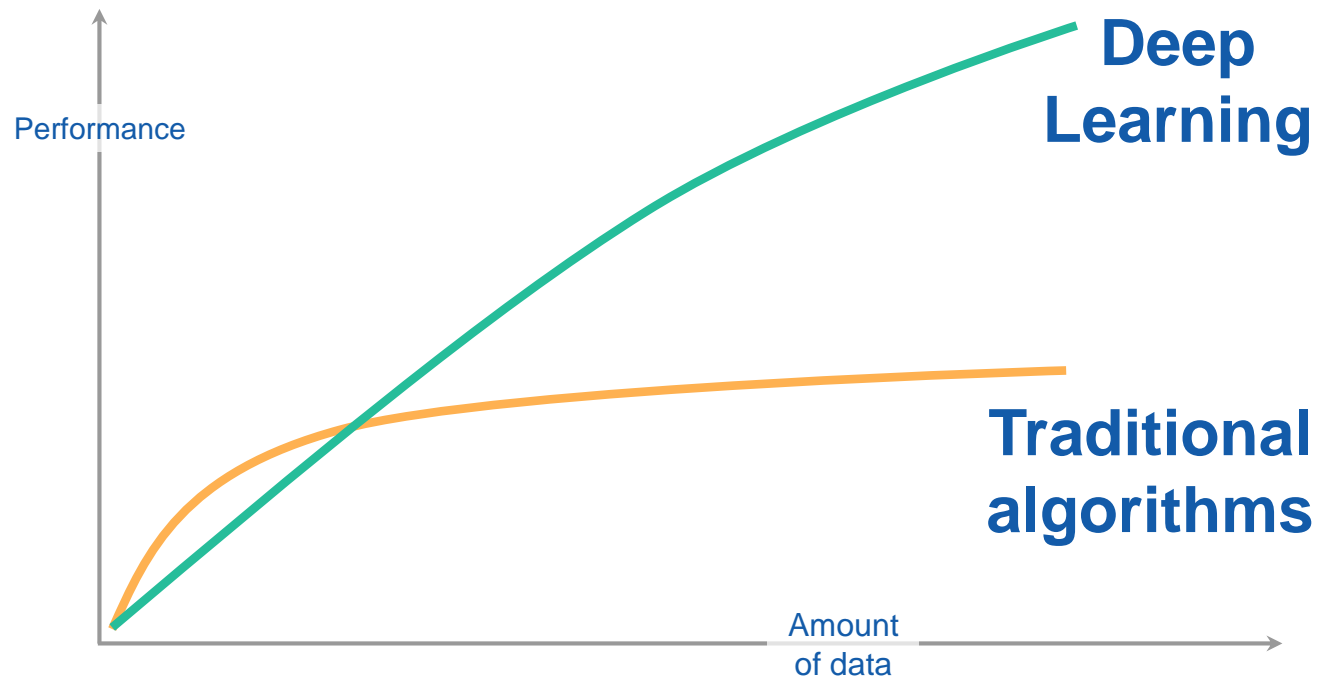
Hallo Pamela,

Vielen Dank für Deine lieben Worte! Ich finde es so klasse, wie viel Du bereits in Deinem Leben geändert hast. Du kannst wirklich stolz auf Dich sein :-)

Leider stagniert es hin und wieder auf der Waage, lass Dich davon nicht entmutigen, du bist auf einem tollen Weg!



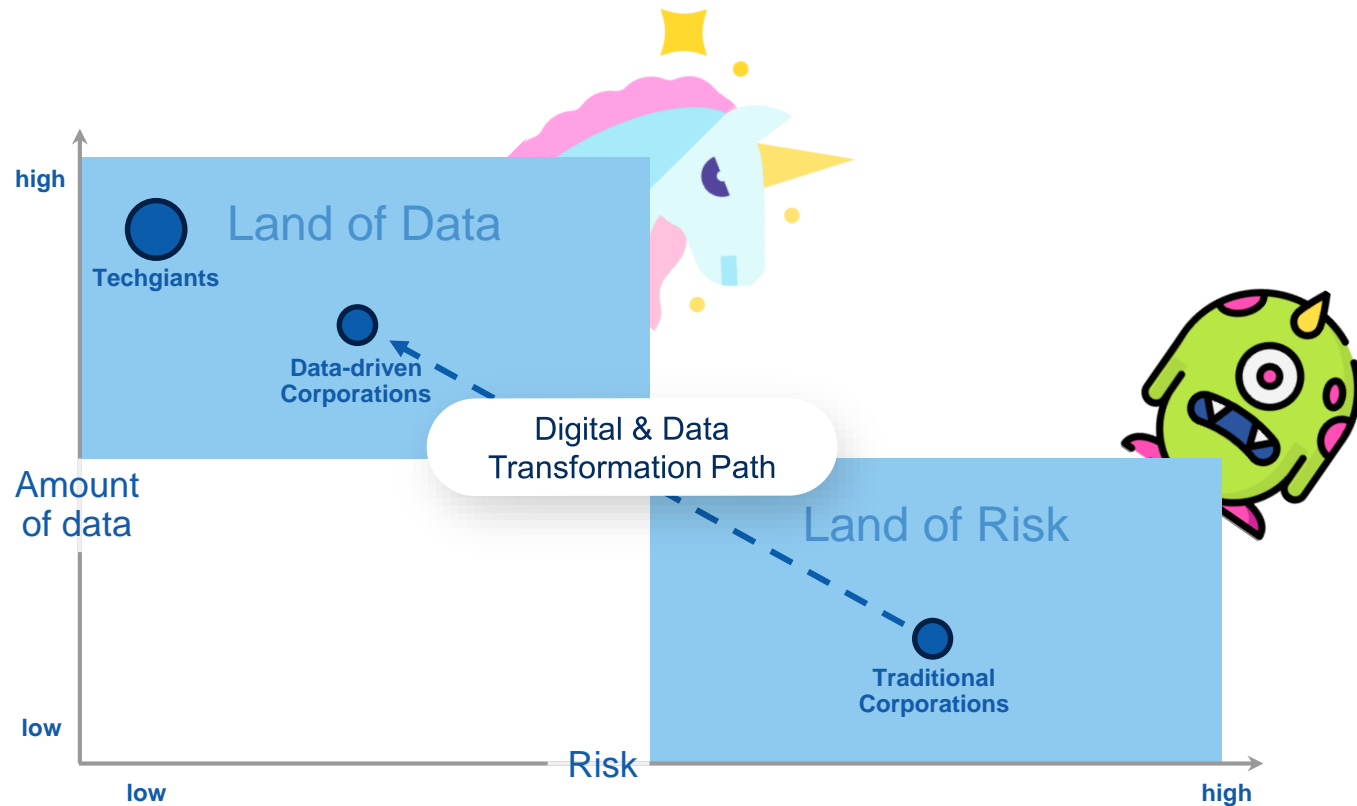
We're on the Edge of the AI Revolution right NOW



D-ALLE has been recently announced



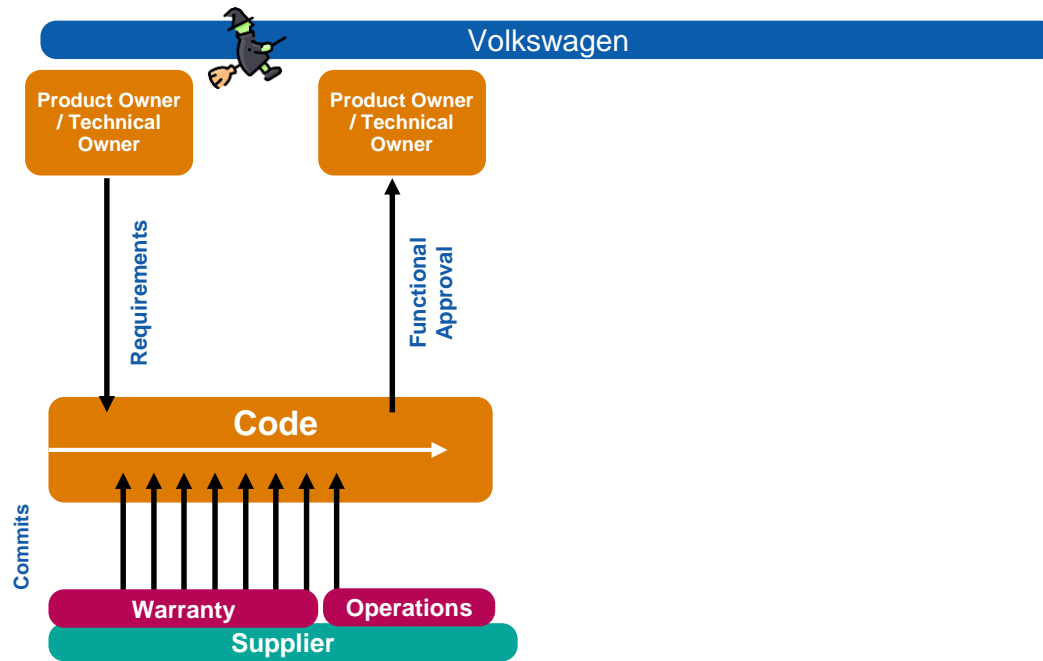
We're in the Land of Risk



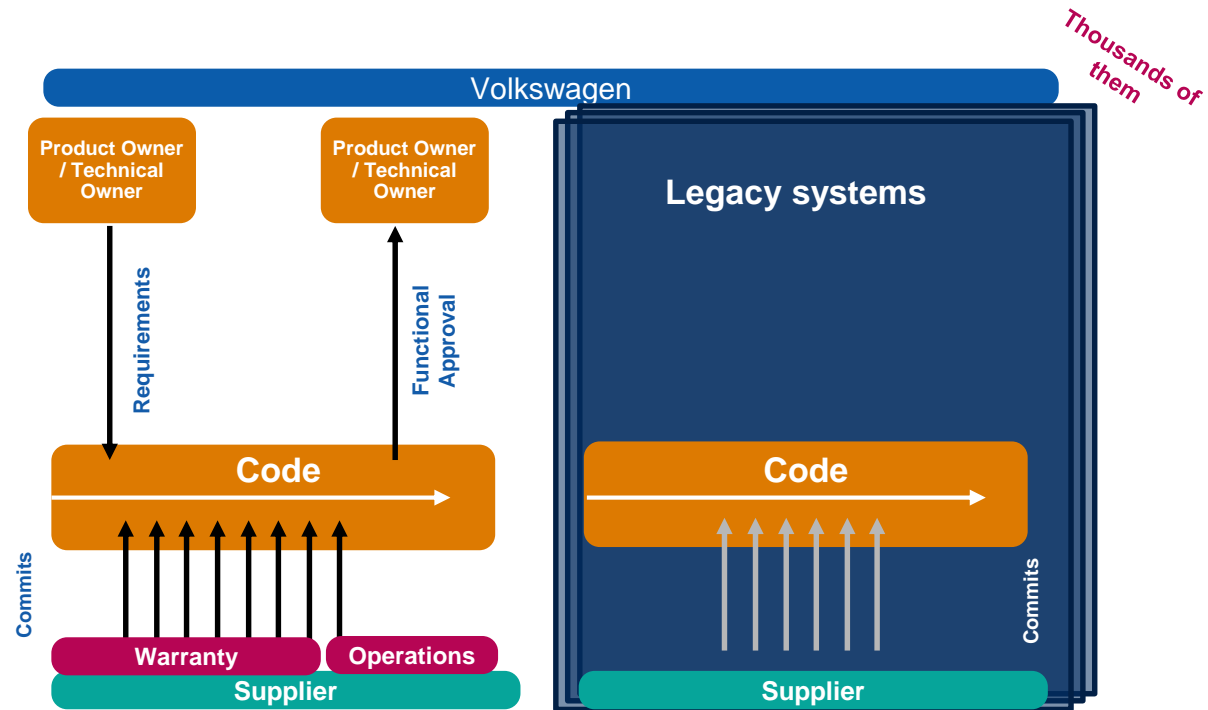
The #1 Secret of the Techgiants

Company	Deployment frequency	Lead time	Stability	Customer-centricity
Amazon	23,000 / day	minutes	high	high
Google	5,500 / day	minutes	high	high
Netflix	500 / day	minutes	high	high
Facebook	1 / day	hours	high	high
Twitter	3 / week	hours	high	High
Typical enterprise	Every 9 months	months	low/medium	low/medium

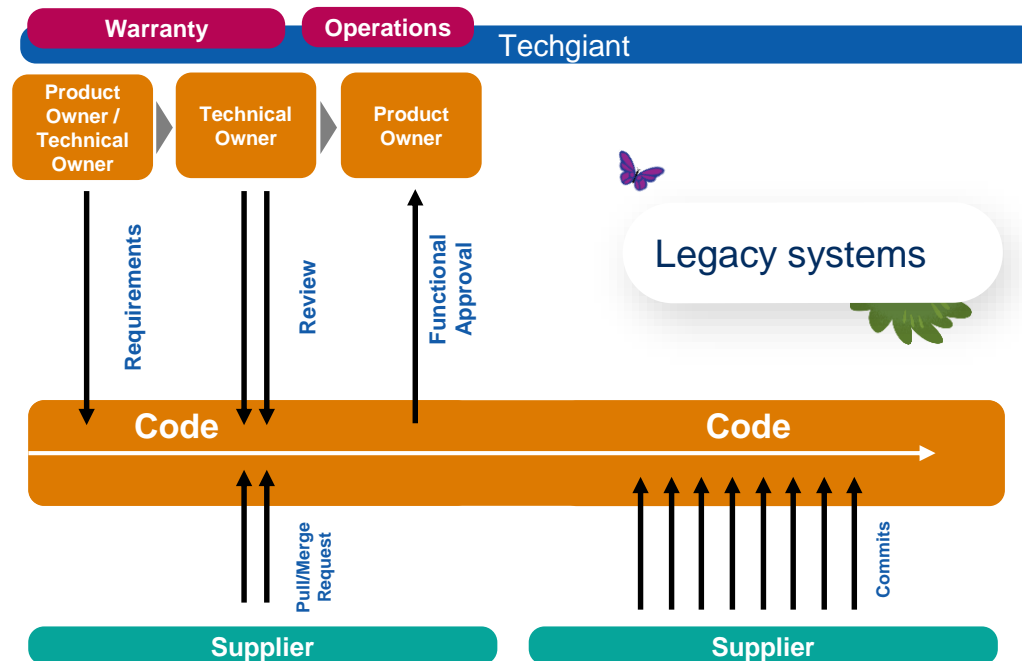
Greatest Bottleneck to Become a Digital Company



We've Thousand of Legacy Systems

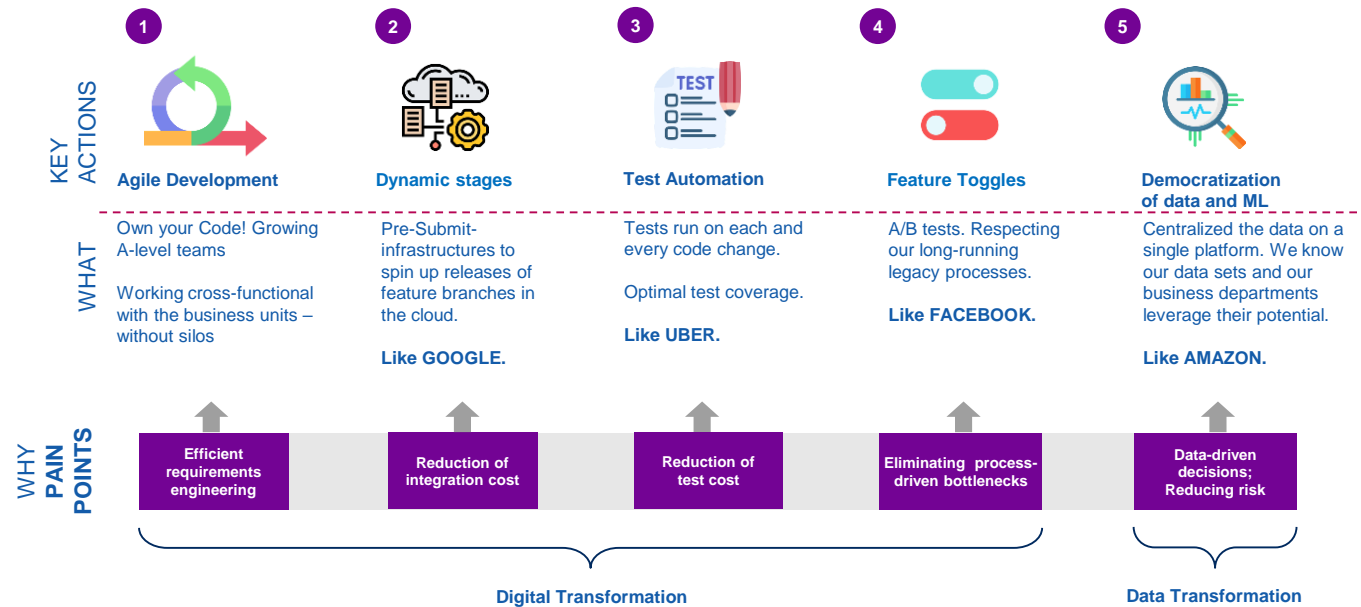
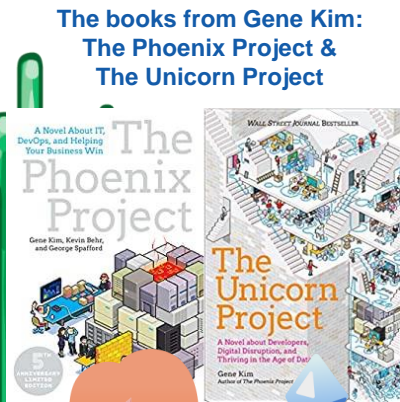


The #2 Secret of the Techgiants



Vision: 1 (digital) SOP per Day

Own your code! Own your data!

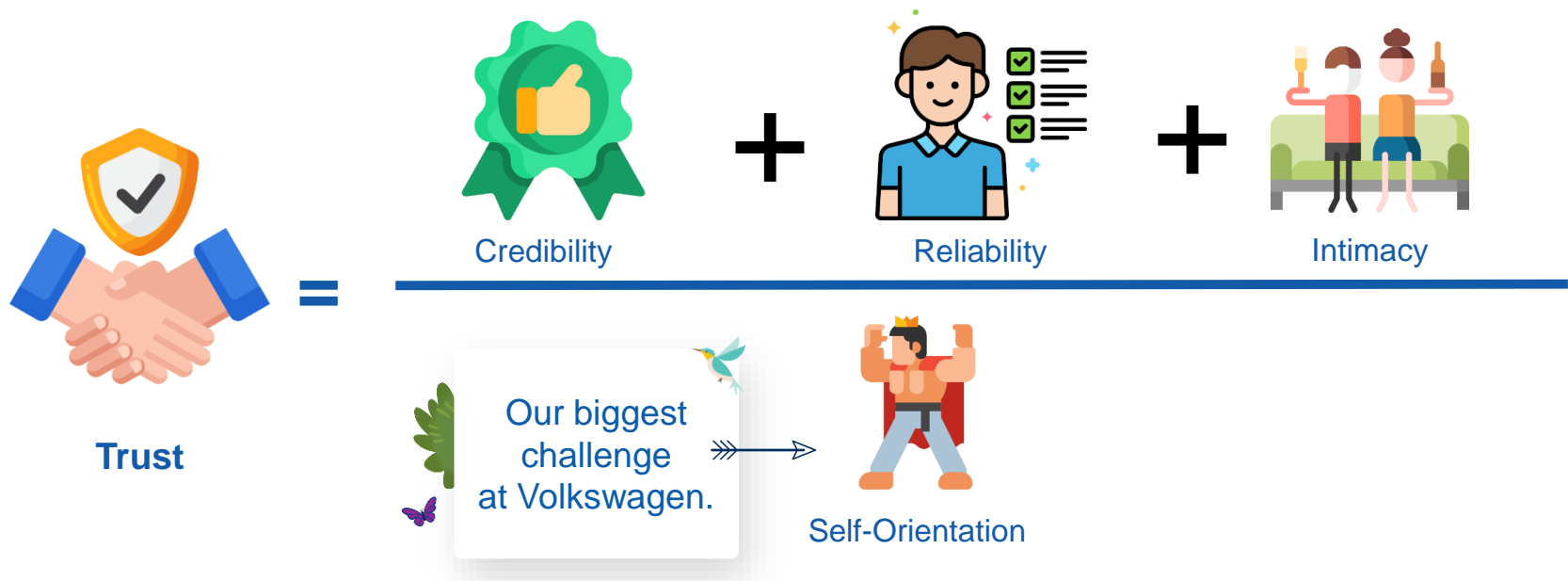


Don't Miss the Forest for the Trees

Simple questions need simple answers **ASAP**



Establishing a data culture and empowering transformation



Agenda

01

Introduction

02

Why Digital & Data Transformation

03

Outlook

04

Summary

We are currently developing digital data products in cross-functional squads at VW CV

VWCV DATA SQUADS

01 MOBILITY

Digital Services and products for VWCV customers:

- 100% Uptime
- TCO Analytics
- ...



Predictive Maintenance

02 CUSTOMER

360° Customer View:

- Upselling Recommender
- Next-best vehicle to buy
- Target Operating Model



e-Readiness

03 VEHICLE

Data-driven vehicle development:

- Driving profile analysis
- Optimization Vehicle dimensioning
- Automation for Analytics WBs



Snowpark

04 SMART FACTORY

Efficient production and logistics:

- Demand vs. supply prediction
- Support Data lake for DPP@VWN
- Predictive Maintenance



SmartRisk

05 OPEX

Digital company and processes:

- Adoption Group Digital- and API-Strategy
- Data Warehousing & BI MS Azure
- ...



ODin

Use Cases up to now

Step #1: Enabling the Management Board

Sales vs. budget

Daily overview for the management board about the sold volumes of all car models and regions. Dashboard is connected to all dealer systems. Data quality has been verified.

Drill-down into the sales regions

Sophisticated drill-down capabilities to compare the performance of the car models and brands to previous years.



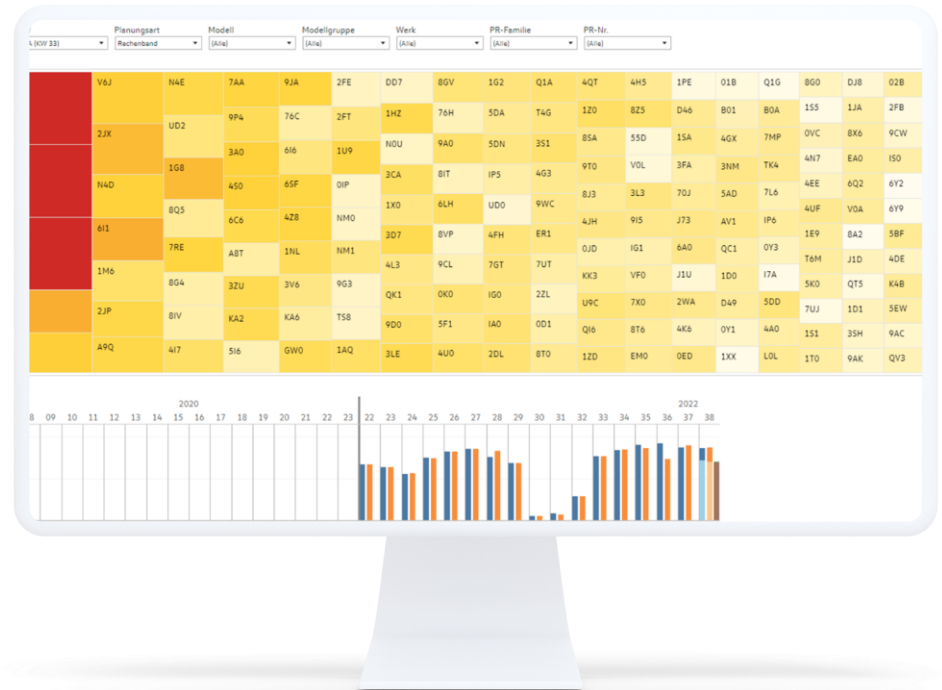
Step #2: Enabling the Production

Component shortage overview

More and more crisis hit our core business. Overview about the shortages, which may occur, for producing the ordered volume. How much of the needed components are available in the upcoming weeks? Which car models should be prioritized, since they yield more profit? The revenues of today finance the transformation of tomorrow.

In work: Predictive maintenance dashboard

Maintenance is conducted too much in advance and parts of robots are replaced, although they are still good. But failures would stop the entire production line. We're helping the production to do smart prediction for parts like welding clamps etc.



Step #3: Enabling the Technical Development

Hardware & software errors

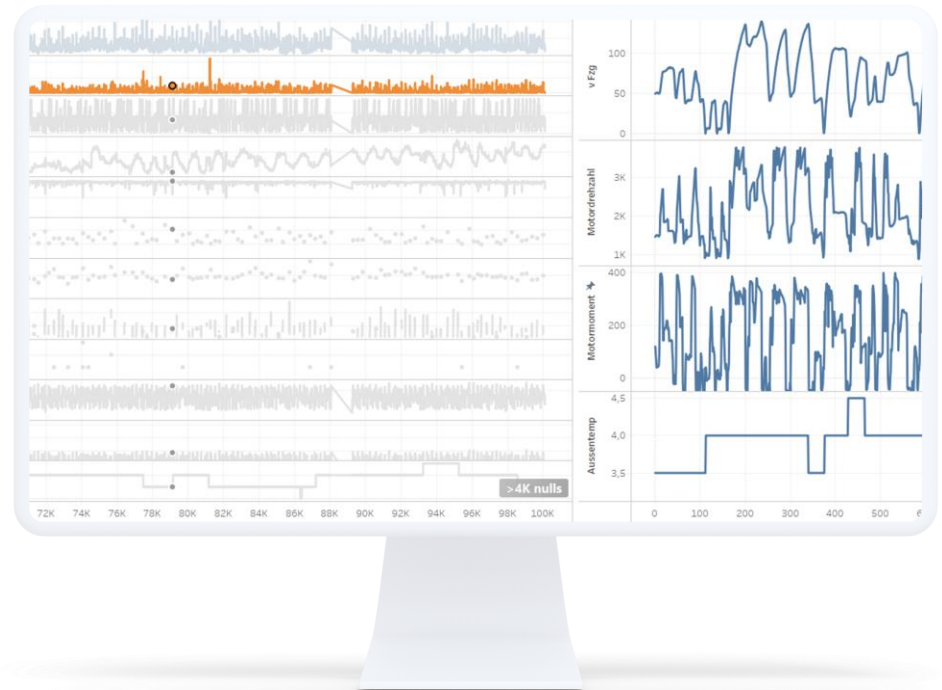
We've customers, who have loggers installed in their car fleets. Additionally, we've test fleets driving thousands of kilometers a day to test new features. Cars are getting more and more complex. With autonomous driving we have sensor data like Lidar, Radar and image sensors, which are analyzed in case of errors. Occurring errors are recorded and displayed in an interactive dashboard.

Drill-down on trillion of data points

We mastered to get “from weeks to days“ in understanding newly occurring errors.

Giving suppliers valuable insights

Communication often makes the difference in finding errors ASAP. Our suppliers get all information they need.



Agenda

01

Introduction

02

Why Digital & Data Transformation

03

Outlook

04

Summary

Summary

1. The next 5– 10 years will probably change the world 😊
2. Digital transformation is the answer to the VUCA-world, crisis and exponential rise of technology
3. Data transformation is needed to take the risk out of decisions