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Chair of Logistics

Trends & Strategies in Finished Car Distribution

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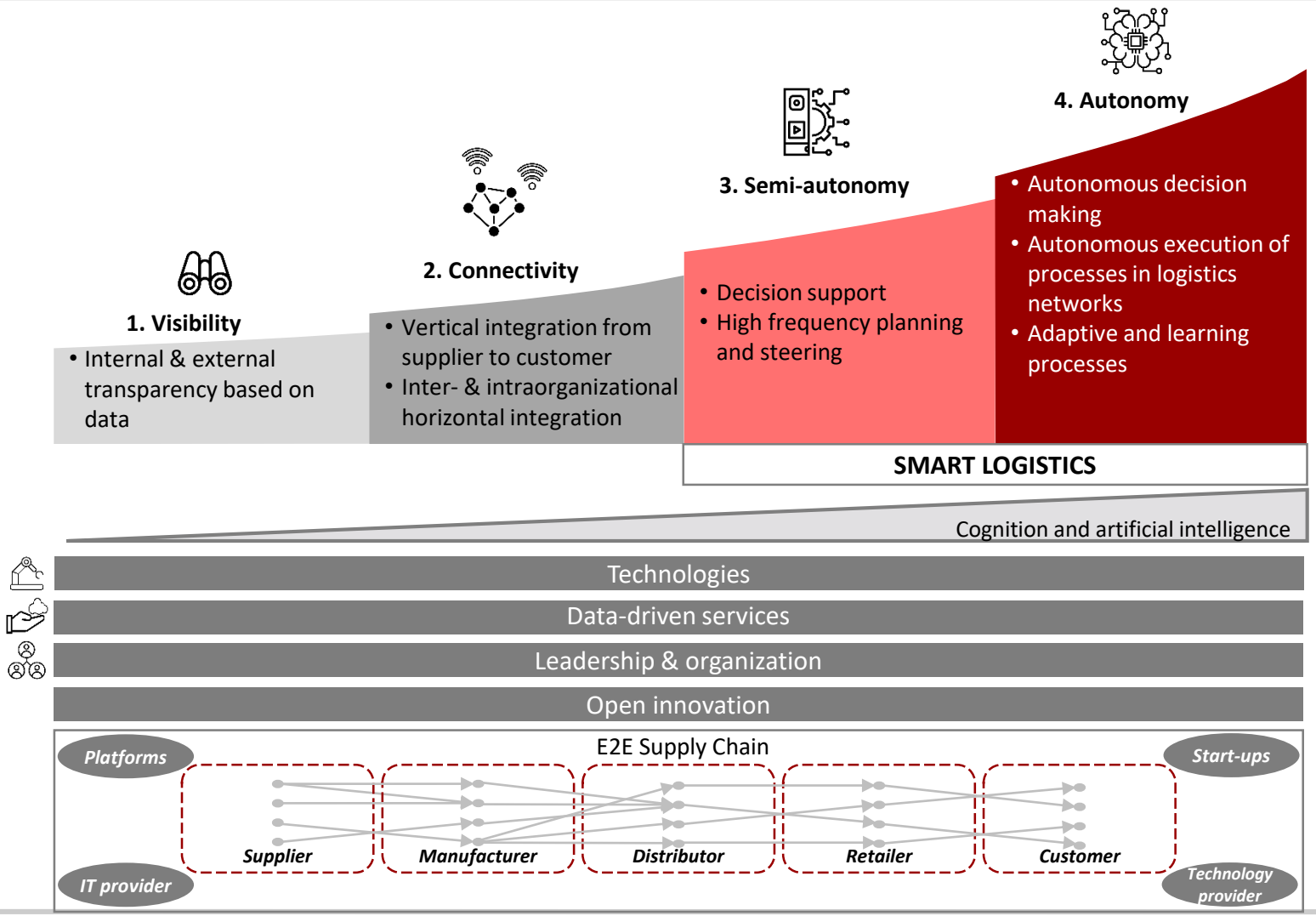
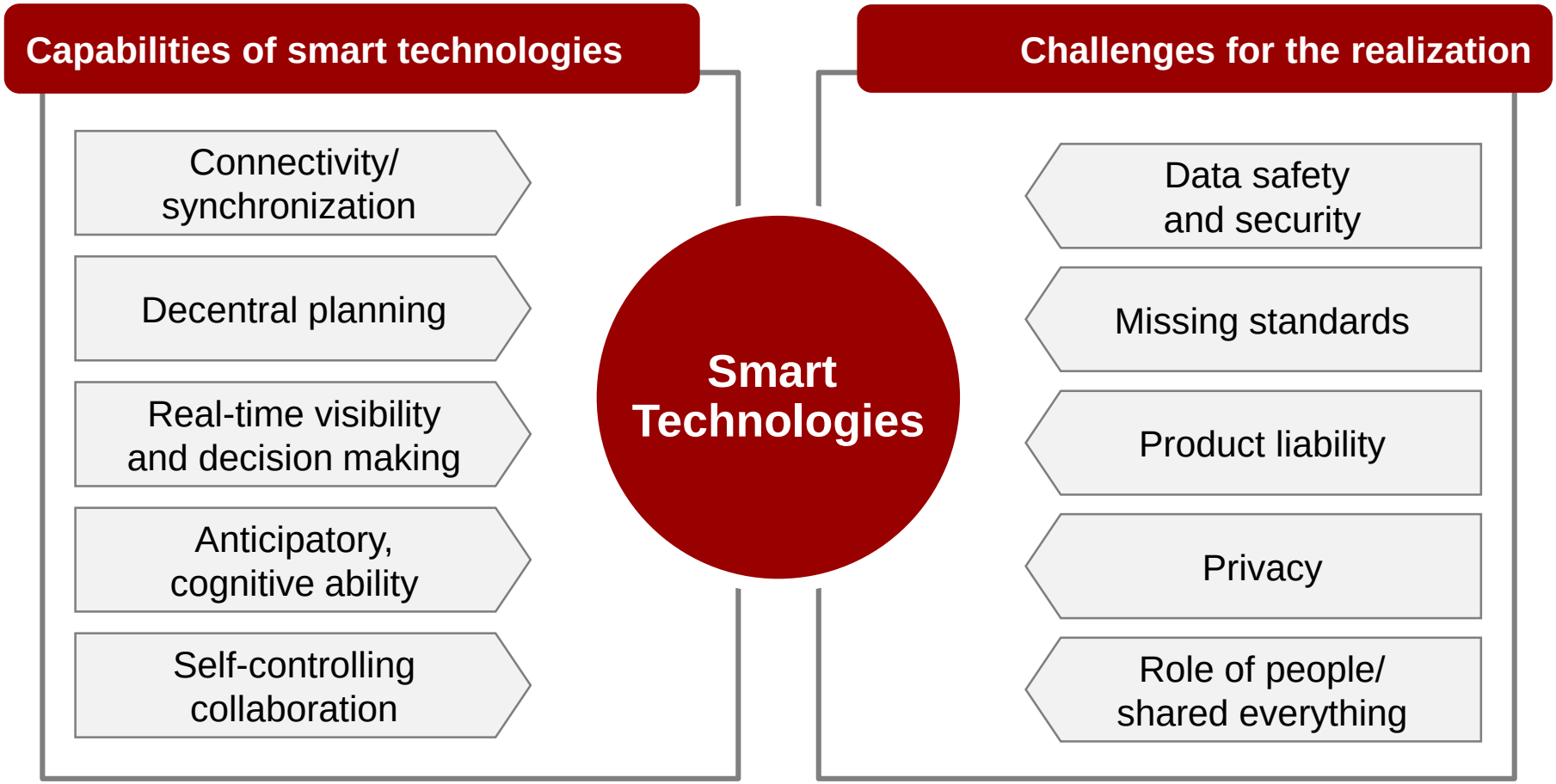
Agenda

1. Trends & Strategies in Logistics and Digitalization
2. Emerging Topics in Finished Car Distribution

Future developments in logistics on the way to autonomy and Smart Logistics

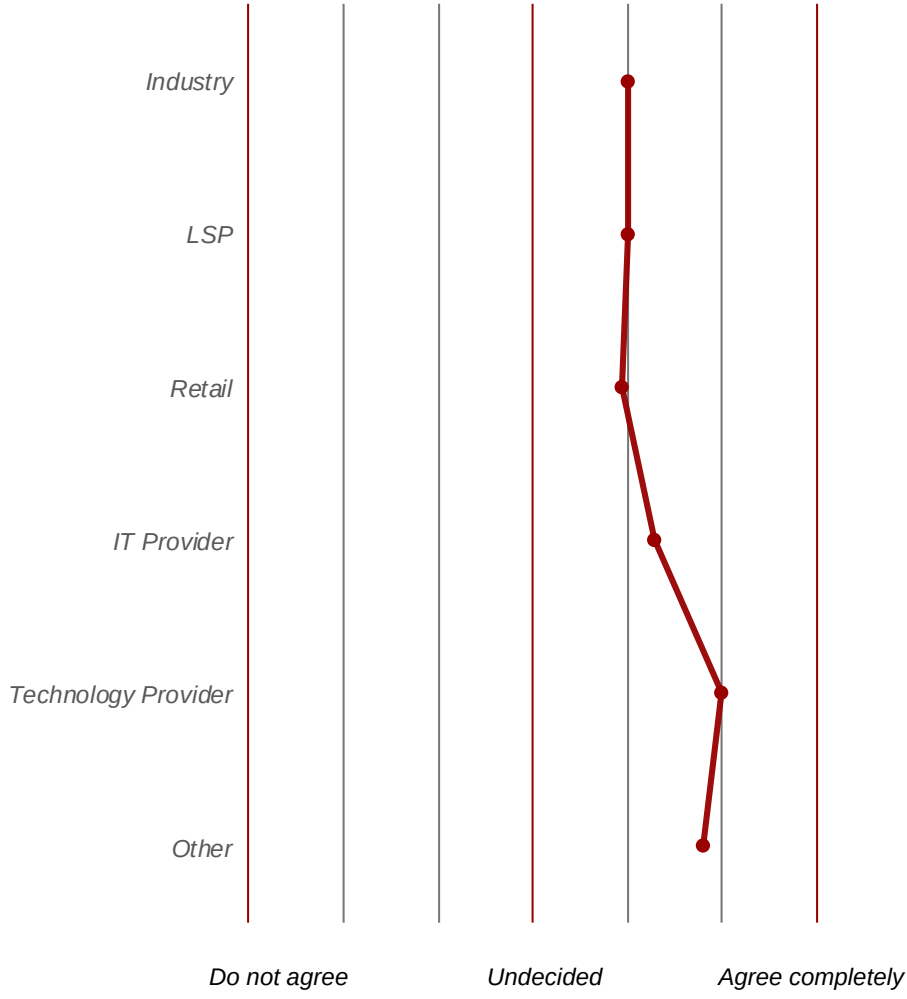


Combination of IoT, services and Cyber-Physical-Systems make the logistics of the future „smart“ and “adaptive”



Experts don’t think that logistics is ready for digitalization in all areas

Q: *Digital transformation requires flexible logistics structures enabled by scalable sub processes and quick decisions. As of today logistics is not sufficiently prepared for these requirements.*
(n =117)

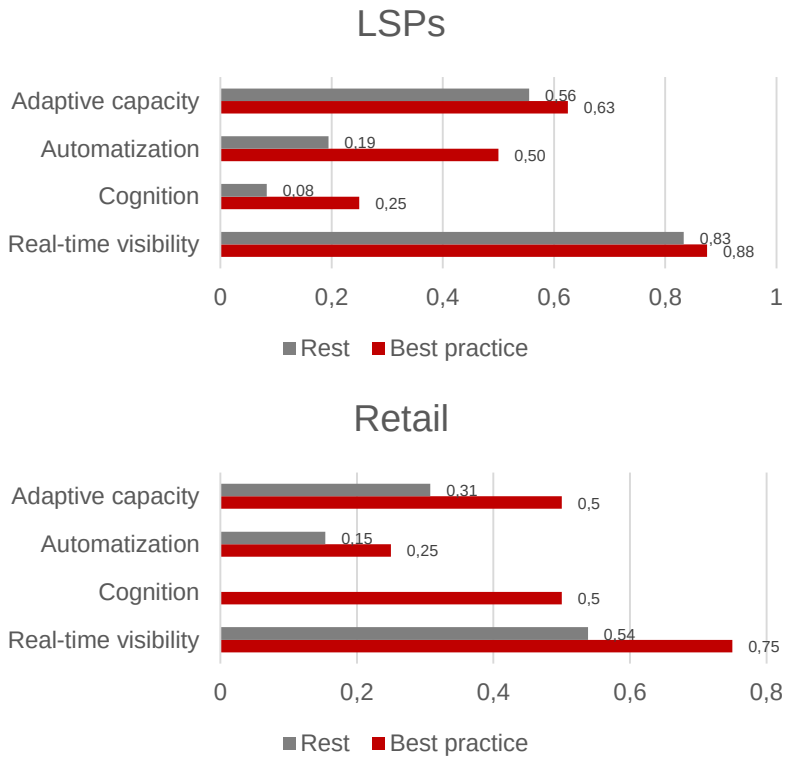


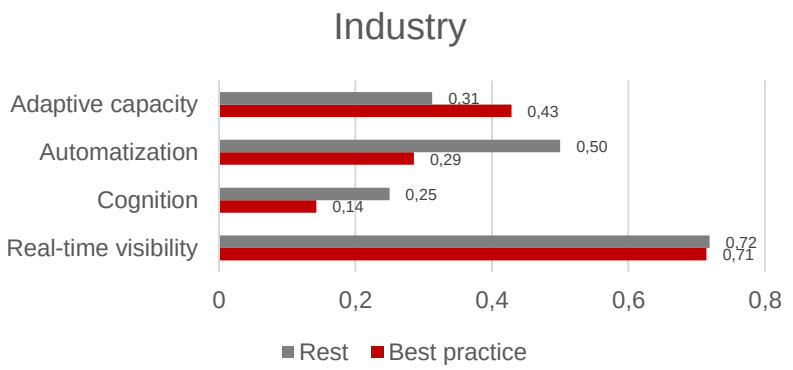
The majority of respondents agree about logistics not being sufficiently prepared to fulfill the requirements of digital transformation.

This highlights the need to act.

Best practice companies implement a broader approach of digital logistics quicker and use more technologies

Smart technologies





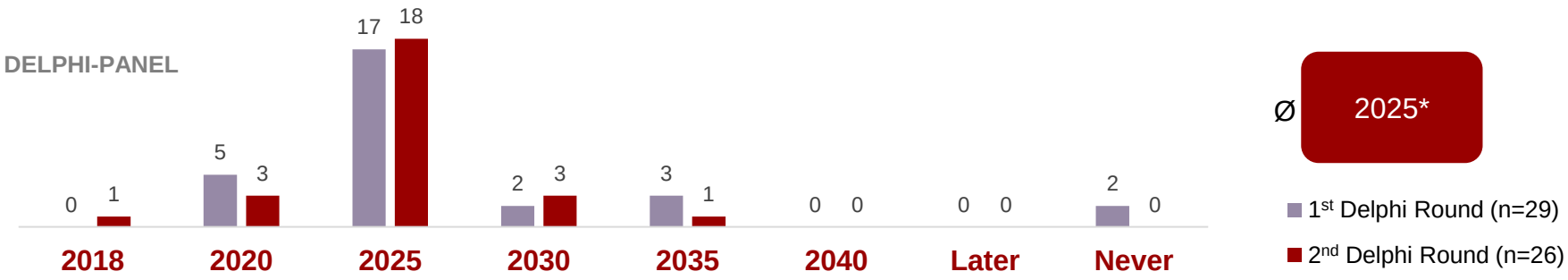
- BP = Best Practice (companies were analyzed by assessing four KPIs (delivery time, delivery reliability, delivery flexibility and out of stock time), the top quintile serves as BP sample)
- % shows numbers of companies having already implemented smart technologies with the stated capabilities (“already operational” or “pilot phase”)

- Enabling **real-time visibility** is established to lay the basis for analysis and optimization of logistics processes.
- Fostering cognitive capability (e.g. machine learning) is pursued to a lesser extent. Retail and LSP best practice companies seem to benefit from the application of machine learning to enable **cognitive capabilities** with regard to the assessed logistics KPIs.

Most experts agree that the freight business will be handled via platforms by 2025

Thesis: Platforms

- The freight business in logistics is largely handled via platforms.



Success Factors

- Transparency (e.g. for capacities)
- Cost efficiency
- Speed (e.g. processing)
- Better capacity/resource utilization
- IT interfaces, which are easy to integrate

Barriers

- Compliance (e.g. tender management)
- People (processes and mindset)
- Trust (no face to the customer)
- Cost intensive rework
- Process hurdles due to lacking standards

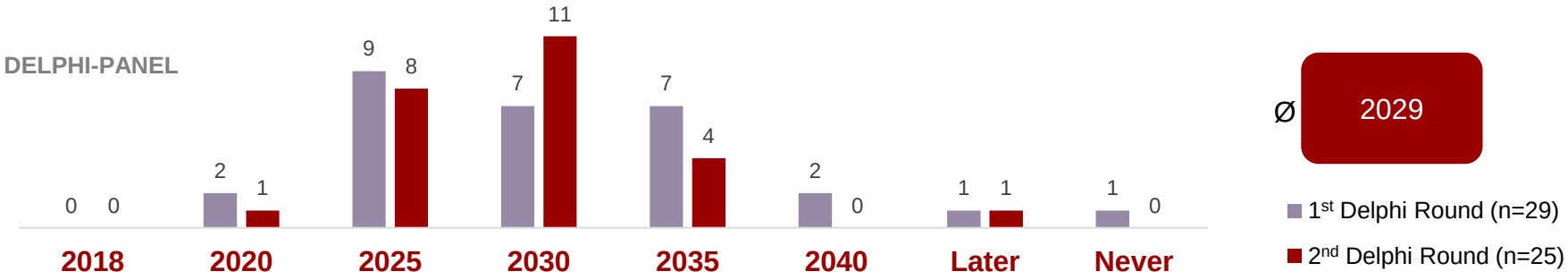
- Main parts of freight business will be handled via platforms by 2025.
- This will occur for standardized transports and operations, for special requirements (e.g. chemical industry) either niche solutions of platforms will appear or traditional business will prevail.

* excl. answers “Later” and “Never”
(also applicable for the following slides)

Technologies for automation for operational logistics functions will become a driving factor within 10 years

Thesis: Technologies for operational logistics functions to increase the service level

- The fully autonomous handling of business processes in the most important operational logistics functions will enable companies to offer their customers a higher level of service.



Success Factors

- Better capacity utilization (efficiency increases)
- For routine tasks
- Transparency about data flows
- Speed

Barriers

- Flexibility decreases
- Number of variants (services are constantly evolving)
- Investment
- Legal framework and liability

- Fully autonomous handling of the most important operational logistics functions will probably become true in a decade.
- Autonomous processes will redefine the customer interface and services offered, however issues such as legal and data hurdles as well as handling the variety of services for customer value added need to be solved.

Study: Pathway of digital transformation

Agenda

1. Trends & Strategies in Logistics and Digitalization
2. Emerging Topics in Finished Car Distribution

The finished car distribution will be optimized by data driven technologies and services

Artificial Intelligence for yard and transport management

- **Coordination** and **control** of all movements, activities of modes of transport within and outside a premise
- **Status tracking**

Blockchains for documents

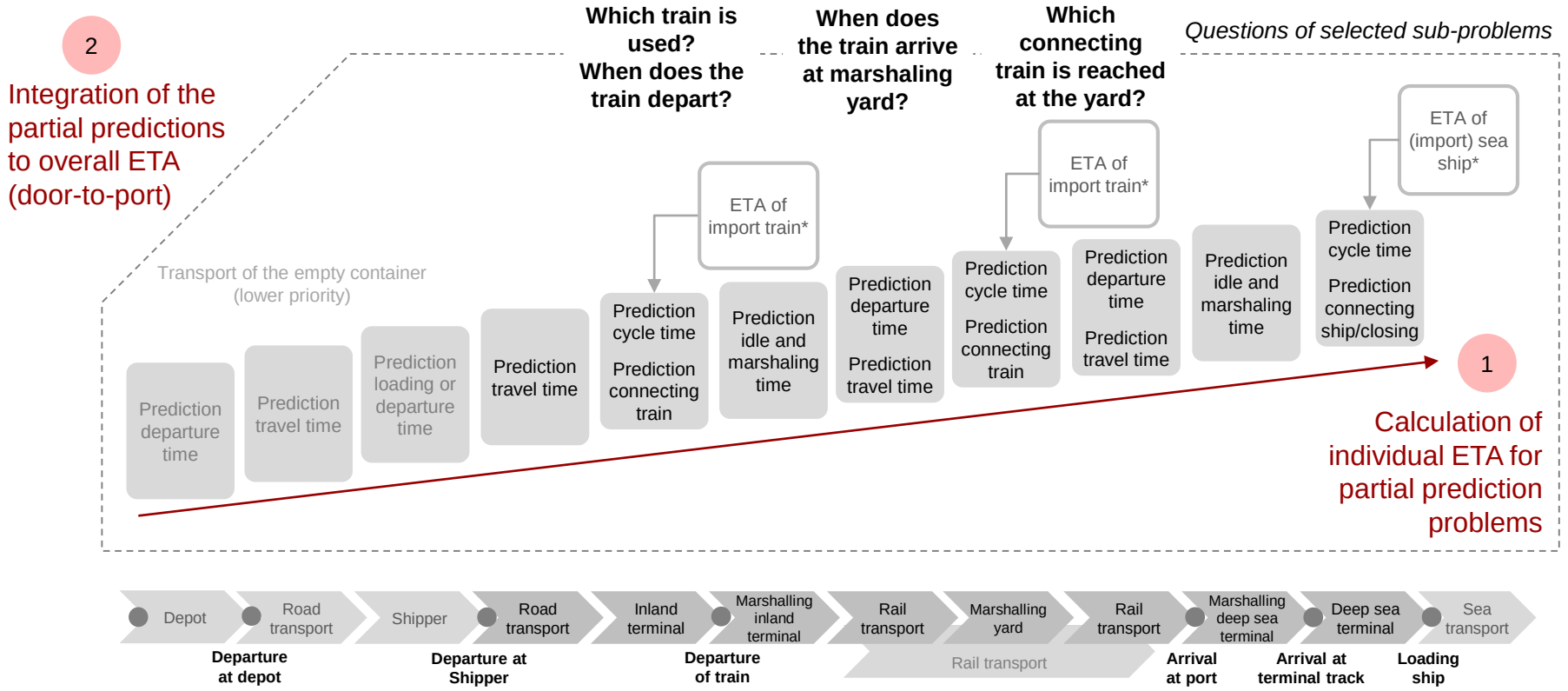
- **Creation** of a digital asset and storage of the digital proof (signature) to the Blockchain
- **Transmission** of the digital asset
- **Verifying** the validity of a digital assets

Forecasting models

- **Data science** analyses
- **Machine learning** to improve forecasting models
- High data **quality** and **validity**

Project SMECS (Smart Event Forecast for Seaports) – Several sub-problems for determining the overall ETA

- Developing a **decision-supporting system** that allows a **target-oriented and more efficient disruption** along the maritime transport chain
- ETA calculation for the entire **maritime pre leg (door-to-port/-ship)** consists of **various partial prediction models** for the individual process sections, which differ strongly in terms of operational restrictions and data aspects

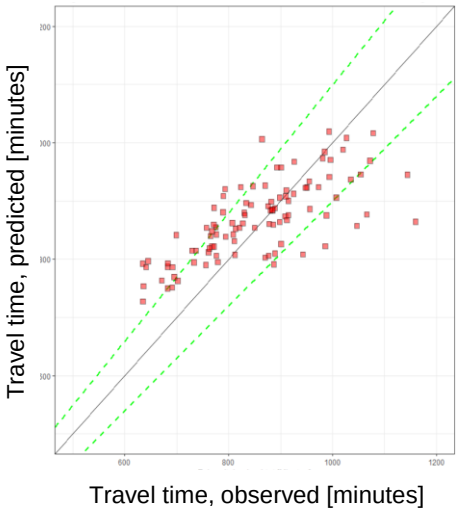


Results and quality of ETA analyses – Exemplary development stages for rail transport ETA

- **Promising ETA prediction results** can already be achieved through the **data-based approach**
- Further **features** and various **model configurations** of the prediction **are constantly being implemented**

1

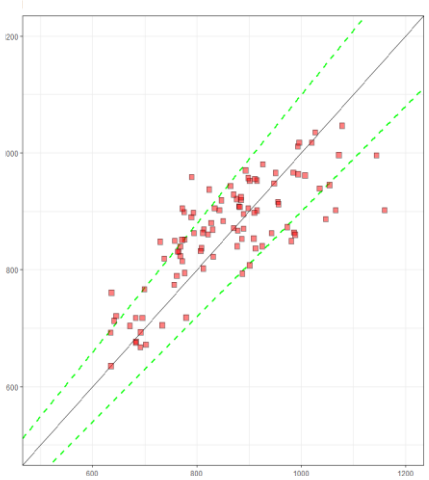
Prediction quality*: 68%



Included features:
- Mean travel time

2

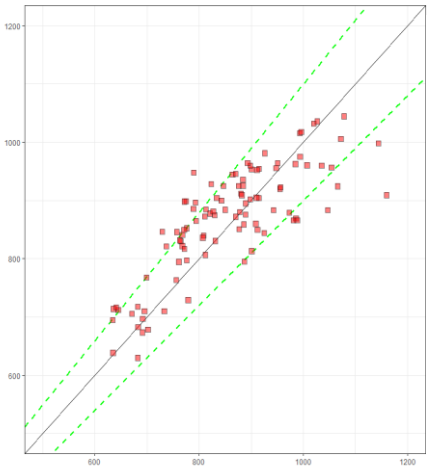
Prediction quality*: 76%



Additional features:
- Timely features, incl. month, day, holidays

3

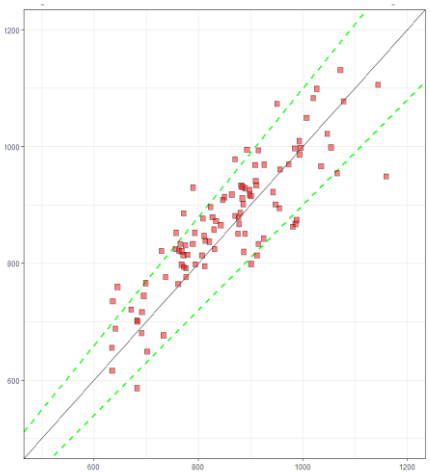
Prediction quality*: 79%



Additional features:
- Current deviation from schedule
- Characteristics of the train, e.g. mass, length, max. speed

4

Prediction quality*: 86%



Additional features:
- Changes of train staff
- Average travel time

The finished car distribution underlies changes in its network structure and is in need for sustainability

Transport distances

Increasing transport distances due to globalization effects:

- production in low-cost countries with a high export share
- globally distributed sales markets
- Increasing intercontinental shipping traffic due to global distribution chains

Flexibility of the LSP

- Planning and awarding procedures of the OEMs require high flexibility of the LSP
- Small LSPs in particular cannot keep up with this, as flexibility requires a great deal of investment (wagons, trucks, etc.)
- Award procedures should be applied to entire regions so that LSPs have a chance of optimization

City Logistics

- New requirements for vehicle distribution in regard to the modern urban infrastructure plans (relief of cities through service hub models).
- These include topics such as electromobility, truck dimensions adapted to the city's infrastructure concept or new truck bodies

MoT Shift

MoT shifts from road to rail:

- Environmental sustainability
- Higher loading factor
- Traffic relief of roads
- Block-trains for long distance traffic

Service Level

- Service level of distribution logistics is becoming increasingly important
- Demand for transparency regarding delivery dates is increasing (e.g. due to the trend in delivery tracking from other industries)

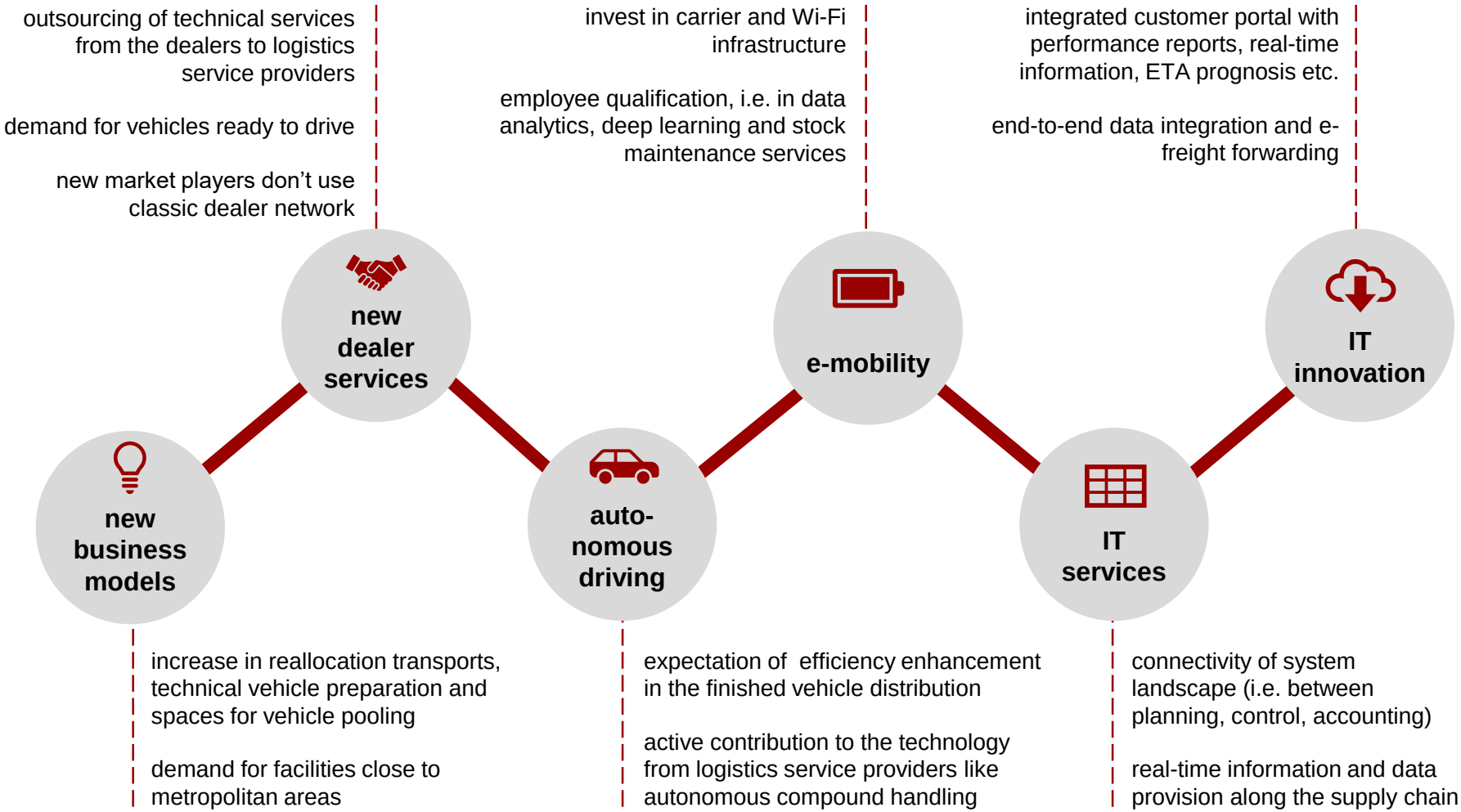
Model to plant ratio

On average fewer plants are producing a certain model:

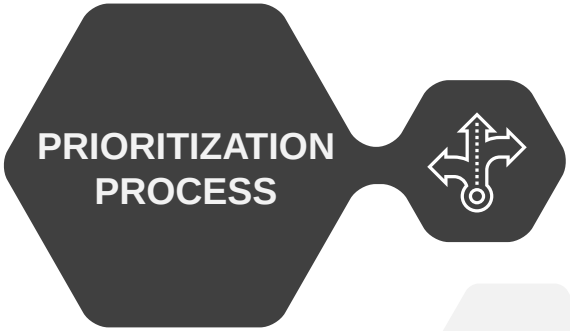
- Model still has a global demand (e.g. due to e-commerce sales channels)
- Increase in vehicle modifications after factory delivery due to changed postponement strategy

Minimize **costs** in regard to **direct transport, storage, lead times, repairs, CO2 emissions** and furthermore. Network optimization can be supported by modern software tools.

The changes result in several trends for the finished vehicle distribution



Connected car distribution results in changes in the prioritization, acceleration and disposition processes



Challenges and solutions for the prioritization process

- Recognition of time-critical vehicles and prioritized processing
- Designated parking spaces for time-critical vehicles

Effectiveness in the process chain

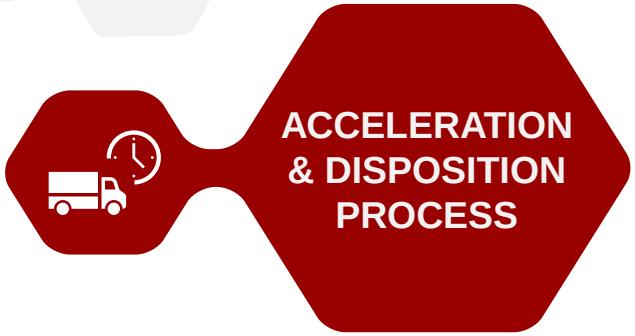
- Distribution control
- Potential setting levers
- Use of space
- Digitalization

Effects of the acceleration process on the disposition process

- Planning and provision of transport capacities based on forecast information
- Consideration of endogenous factors (e.g. weather forecast) in transport planning
- Control according to deadlines to fulfil the customer-specific desired deadline

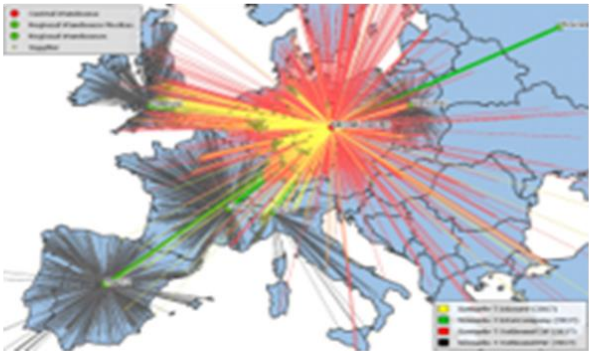
Effectiveness in the process chain

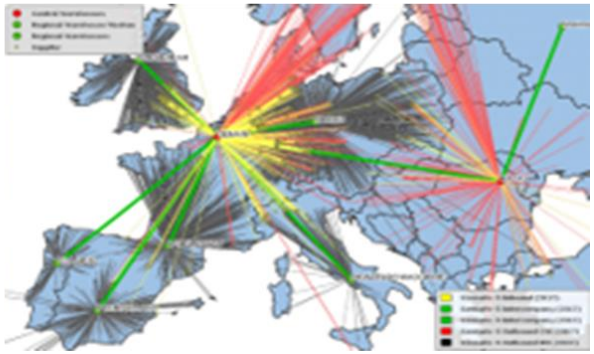
- Volume Forecast
- Weather report
- Alignment with customer requirements
- Scheduling control



Implementation example of the evaluation of network changes as a function of different CO2 prices

Current CO2 prices (40 € per to. CO2e corresponds to the politically and scientifically discussed minimum, 145 € per to. CO2e corresponds to an extensive internalization of the corresponding external costs of the emission) were examined with regard to their effect on the design of a distribution network.





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Actual Network

Ist-Netzwerk charakterisiert durch europäisches Zentrallager, mit optimaler Standortkostenstruktur

40

Network at 40 € per to. CO2e

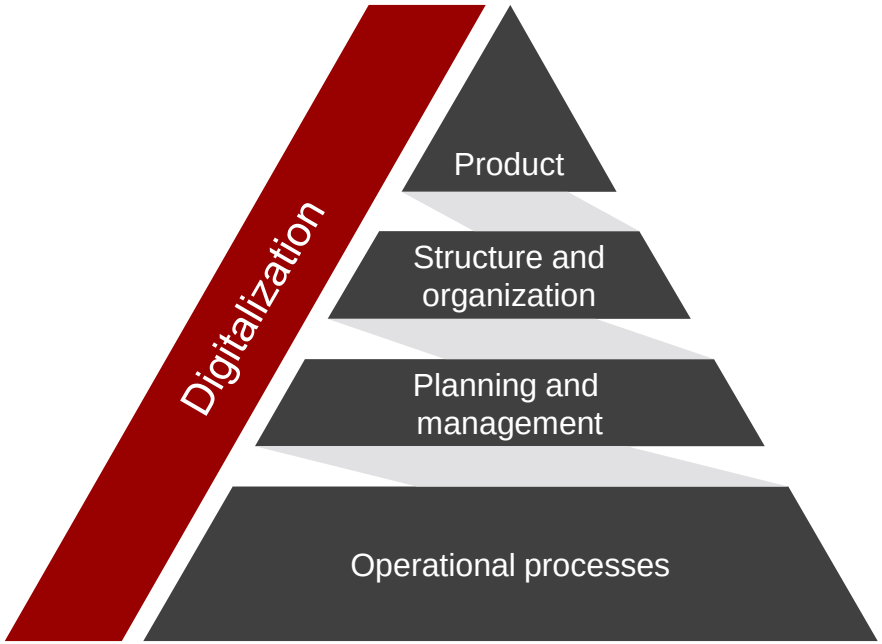
Retention of central warehouse structure, but overweighting of transport efficiency over location cost advantages

100

Network at 100 € per to. CO2e

Significant change in network characteristics from approx. 80 € per to. CO2e towards a more decentralized network structure incl. acceptance of inventory and availability disadvantages

Sustainability in logistics can be measured in terms of the following aspects



Implementation of measures

- Efficiency-enhancing measures have a positive effect on both the ecological and the economic dimension
- Other measures entail additional costs
- Digitisation is an essential enabler of sustainability

Implementation challenges

- Implementation challenges
- The main levers in transport lie in the technology sector and initially require investment.
- There are no evaluation procedures to select the most effective and eco/socially efficient technologies.
- The implementation area often lies outside the own company (e.g. with logistics service providers).

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