

strategy&

Truck Study 2016

The Era of Digitized Trucking



Our clients benefit from our global presence and industry experts in all major regions

Global Presence of Strategy&



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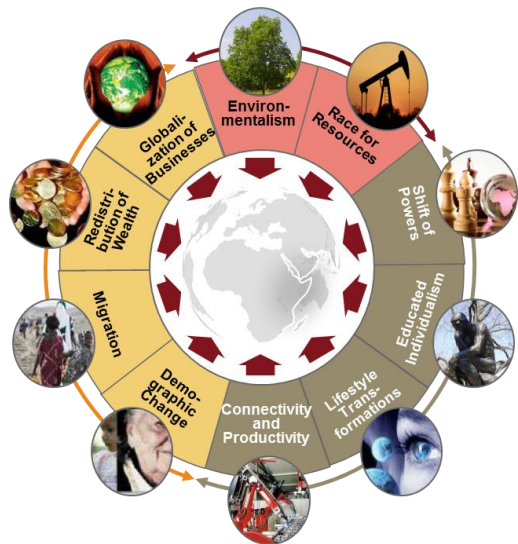
Part of the PwC network

- Oldest management consultancy company globally, founded 1914
- Globally leading strategy and management consultancy company
- More than 60 offices on all six continents
- World-wide staff of more than 3,000 people
- Part of the PwC network
- Client list: 400 of the Fortune Top 500 companies

Global trends will have different impact on two principle market situations requiring tailored strategies to success

Framework Overview

Global Trends



Market Implications – Strategy to Success

Top Market – Industrialized

- Technology leading
- Complex logistics process
- Industrial digitization
- Cloud services
- Focus on TCO

**Effective strategy
to success**

Basic/Value Market – Emerging

- Technology follower
- Universal/multi-use transport solutions
- Limited application of new technologies
- Sensitive investment costs

Source: Strategy& analysis

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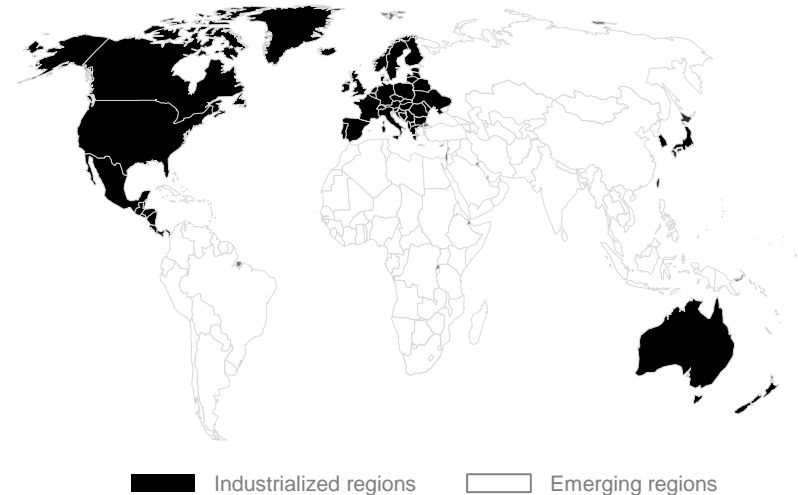
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Digitization will change the entire logistics value chain in four dimensions

Digitization Impact

- 1** *Connectivity, vehicle-to-x communication and autonomous driving will dominate the technological trends in the **top market***
- 2** *Strengthening of **emissions regulations** and **technological developments** will lead to a changed **logistic system** and processes*
- 3** Many industry **stakeholders** will be impacted and **new opportunities** and **business cases** present themselves to the well **prepared stakeholders**
 - **Financial attractiveness** of many of these cases will lead to **increased competition** (TCO approach)
- 4** *We expect in the **long term** a **disruptive development** in the **entire logistics value chain** with significant impact on **their stakeholders***

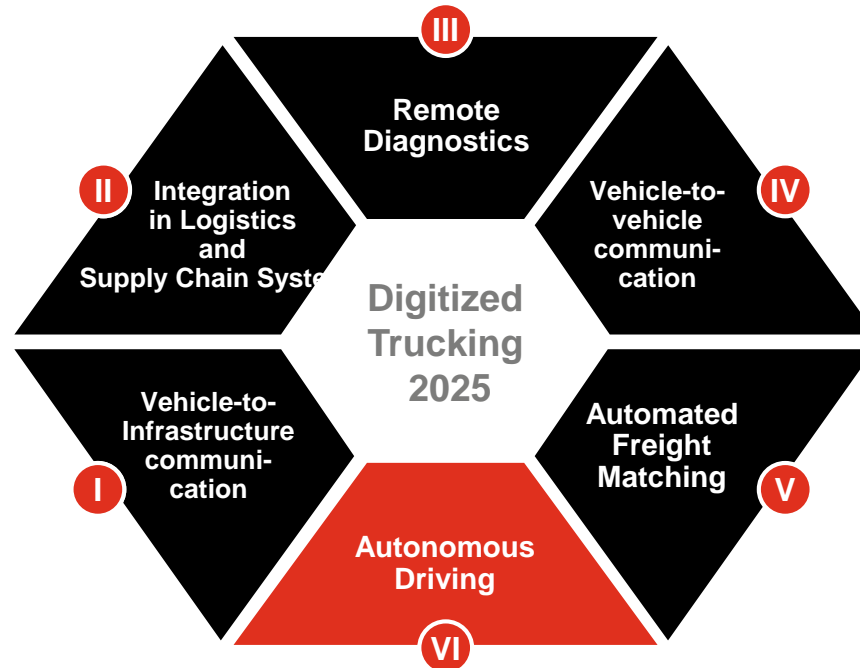
Effects in industrialized regions¹





Six key technological advancements will lead the way forward

Overview of main technological trends

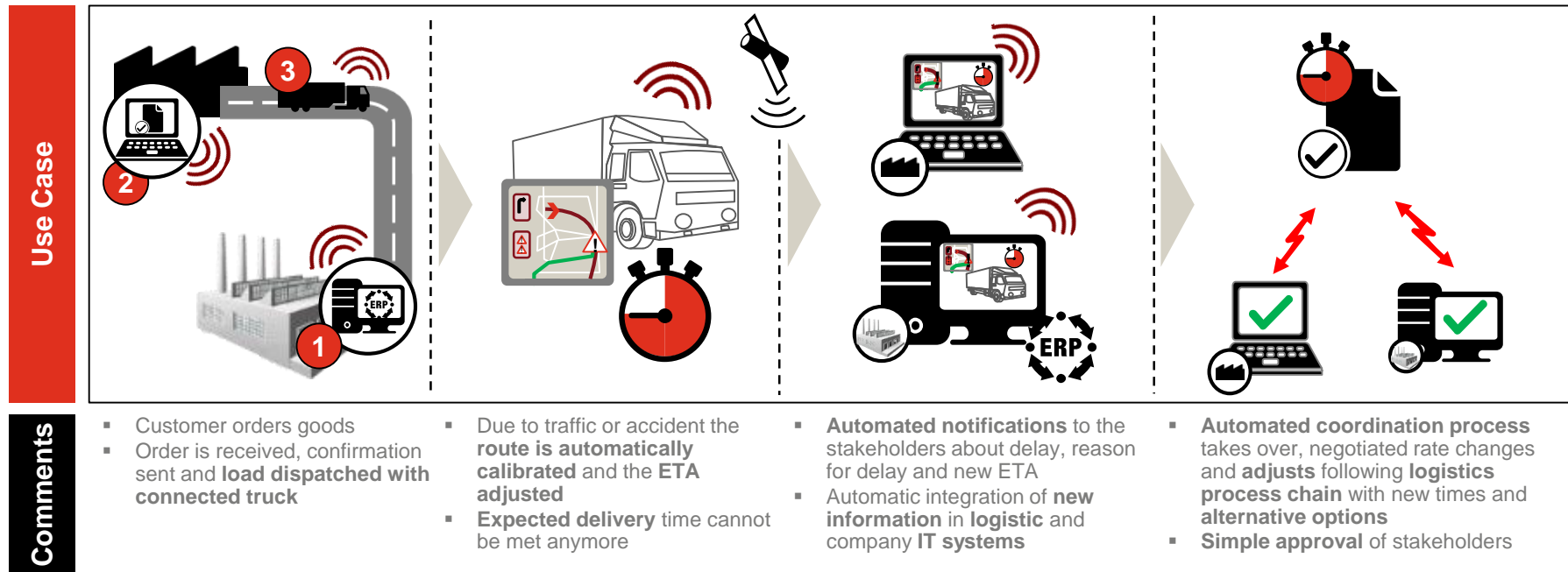


Source: Strategy& analysis

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Integration of real time data in logistic systems will lead to automated coordination processes

II Integration in Logistics and Supply Chain systems

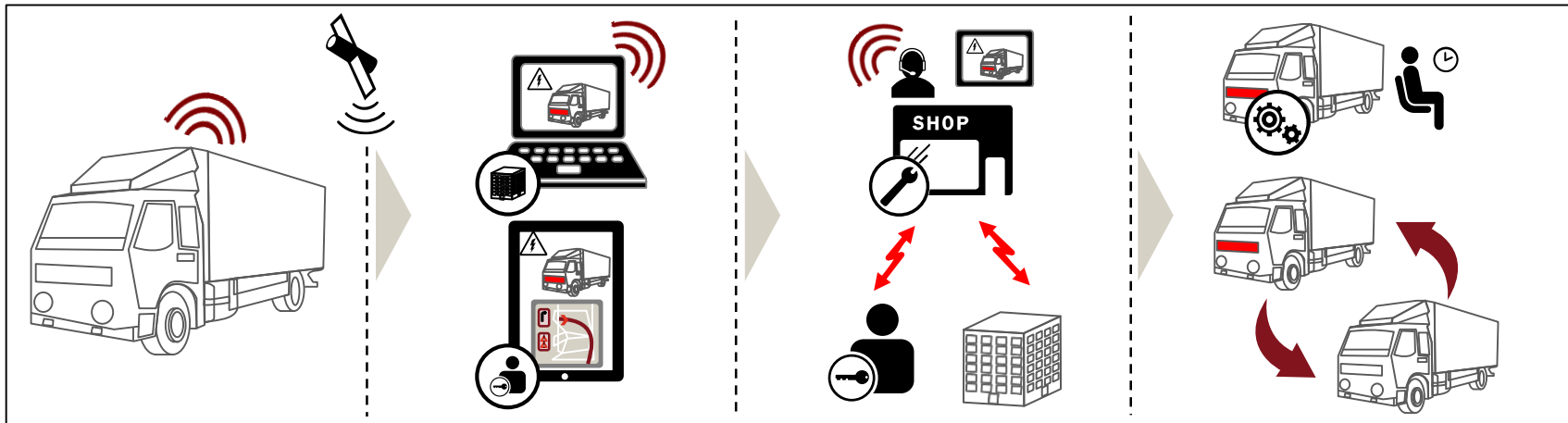


Source: Strategy& analysis

Digitization can enable more efficient repairs and reduce truck down-time considerably

III Remote Diagnostics

Use Case



Comments

- Truck continuously monitors its own **maintenance status**, notifies issues immediately
- Gives **real-time updates** to driver and fleet mgmt:
- Issues and **problem report** are sent to driver and fleet management
- Automated** suggestion of **closest repair shop** (within service agreement) **with spare parts available**
- Chosen **repair shop** is automatically contacted
- Diagnostic report** instantly transmitted
- Repair shop **starts analysis** immediately and has **contact** with fleet management/ driver
- With diagnostic report **already analysed** and problem identified, the **repair can start immediately on truck's arrival**
- Larger mechanical problems will result in **automatic order of replacement vehicle**

Source: Strategy& analysis

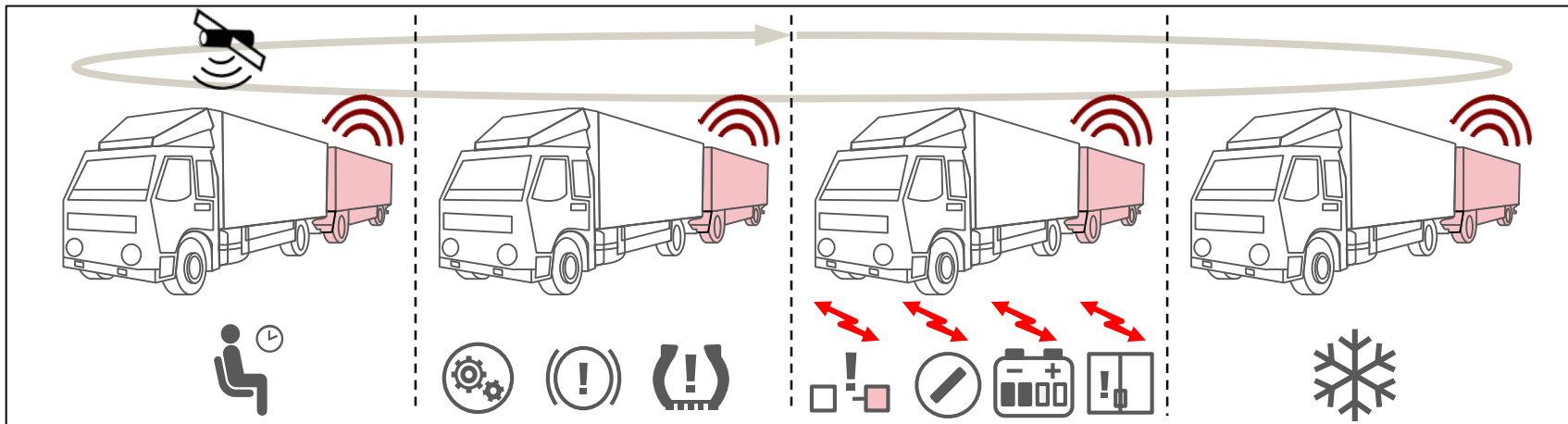
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A smart trailer can serve as a cornerstone of intelligent telematics systems by providing trailer-level data

III Smart Trailer

Use Case



Comments

- Trailer provides telematics data like **position, journey time, routing data and geofencing** information
- Improves **planning, monitoring of driving times, anti-theft protection, routing optimiz.**
- Trailer delivers information on **EBS** regarding **RSS interventions, mileage, speed, hubload, tire pressure and break wear**
- Improves **maintenance planning & corrective actions**
- Truck yields current **coupling status, door opening states, battery status and ignition state of tractor**
- Improves work compliance / **eases consequences from operating errors**
- Truck provides **data for monitoring and controlling temperature** inside reefers
- Improves **cold chain compliance**, seamless documentation of status and adherence to **operating and maintenance cycles**

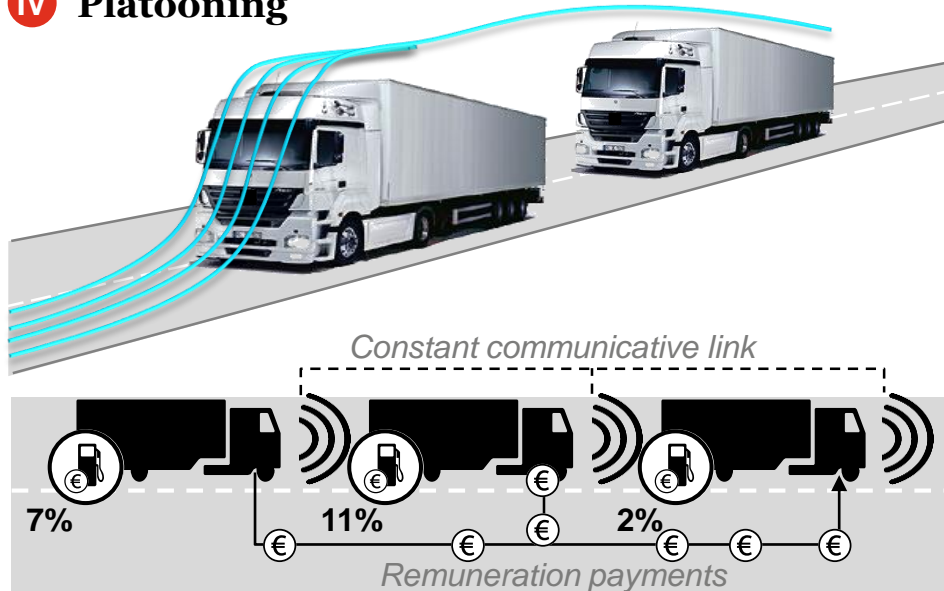
Source: Strategy& analysis

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Platooning technology will reduce fuel consumptions and enable to create new business models for service provider

IV Platooning



Trends and challenges

- Utilizes **vehicle-to-vehicle communications integrated with advanced driving technology**, such as adaptive cruise control, collision avoidance systems, radar etc., to allow multiple trucks to drive in a very tight formation at highway speeds
- Constant communicative link**
- Interlinked trucks **follow driving behaviour of lead truck**
- Platooning technology can save **considerable fuel costs**, depending on trucks position in the platoon (for 3 truck platoon btw. **2 - 11% savings**)
- Remuneration payments** through internal settlement system
- Truck-&-Car platoons possible**

Platooning offers easy operational costs saving through reduced fuel need

Source: Peloton website, Daimler, Lastauto Omnibus (04/16)

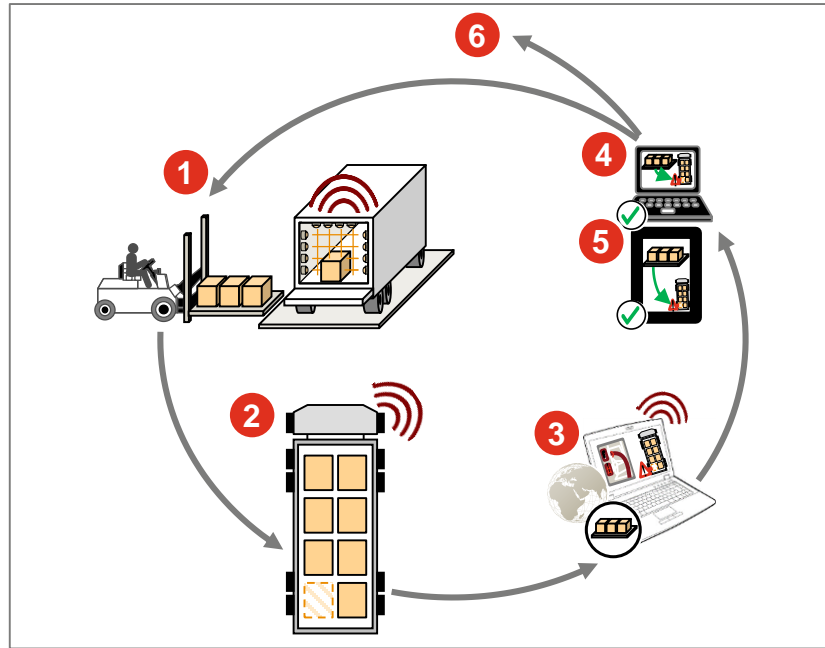
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Interconnectivity and advancements in automated load area tracking will pave the road for automated freight matching

V Automated Freight Matching

Example



Trends and challenges

Sensor based automatic tracking of used up load area

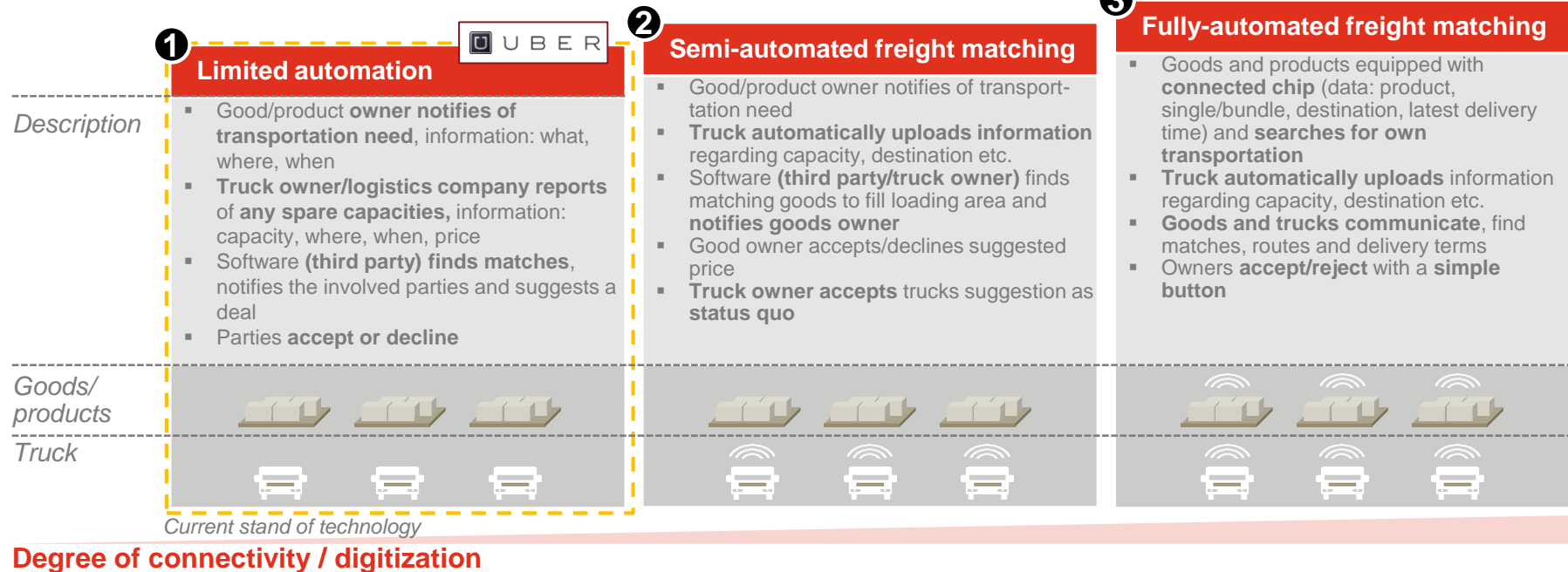
- 1 Trailer recognizes its loading status and communicates it to truck; additional trailer information available (e.g. distance, maintenance, etc.)
- 2 Truck assess current loading weight and available capacity for more efficient transportation
- 3 Truck communicates loading capacity, scheduled route, ETA and other relevant information with digital freight matching platform
- 4 Driver and fleet management is notified about available freight sharing opportunities
- 5 Agreement is struck between truck operator and freight owner/ forewarder/ negotiator
- 6 Additional information can be collected to support trailer location tracking, maintenance organization, rental payments, etc.

Source: Strategy& analysis

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The overhaul of connected and digitized freight matching and transportation is likely to occur in 3 phases

V Automated Freight Matching – ‘Uberization’



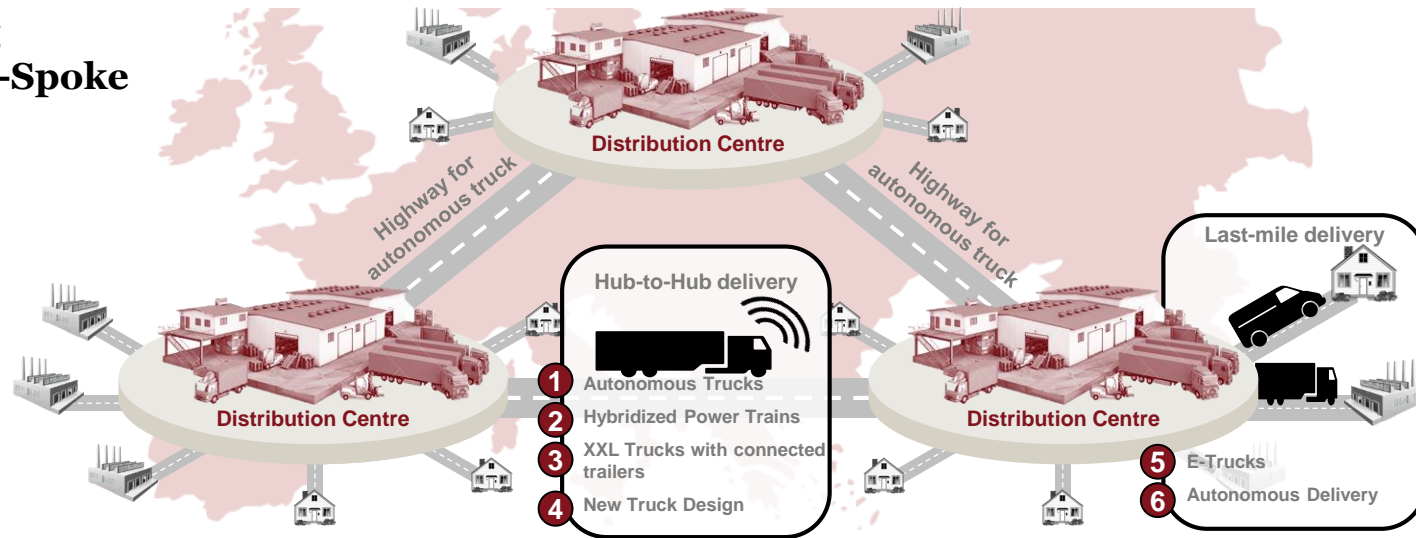
Source: Strategy& analysis

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We will see a much more established Hub-and-Spoke network, similar to the aviation industry

Trucking Hub-and-Spoke



Vision

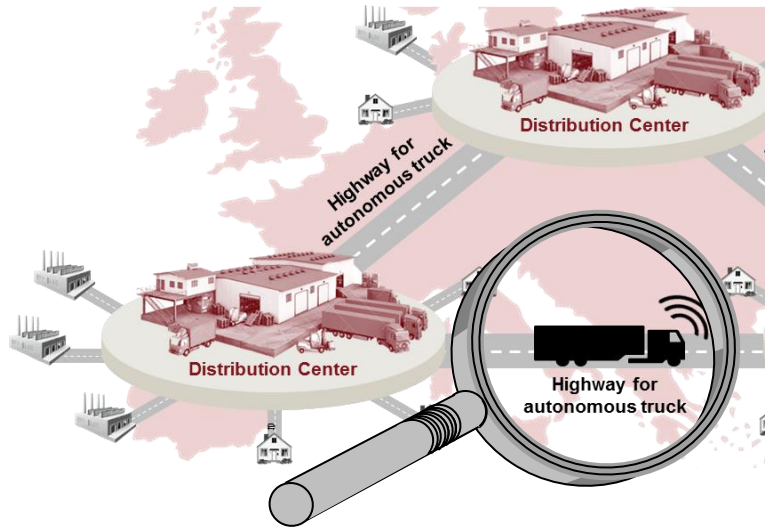
- **Large distribution centres** outside of **agglomeration areas**
- **Data-driven** routing and **freight sharing** between the centres
- Last-mile delivery with **electrified small-to-medium sized trucks**
- **Storage time** in distribution centre **minimal** due to just-in-time delivery planning along the entire supply chain

Source: Strategy& analysis

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The Hub-to-Hub connections will be dominated by autonomous trucks

1 Autonomous Trucks



Vision

- **Autonomous trucks** will **dominate long-distance** transportation between large distribution centres outside of agglomeration areas
- Trucks will have the ability to **drive majority** of Hub-to-Hub route **completely without human interaction**
- **Platooning** between the centres **reduces** need for **long-distance drivers**
- Remaining **drivers** utilize freed up time for logistic **back-office tasks**
- **First road testing** done in **US (Freightliner)** and **Germany (Mercedes-Benz)**

Source: Photo by Daimler

Highways will see a considerable increase in XXL trucks in different constellations

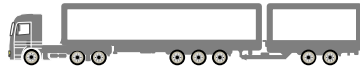
3 XXL Trucks

8 EuroCombi variations in EWR states

A: Motor vehicle with dolly and semitrailer



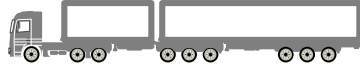
B: Articulated truck with semitrailer and trailer



C: Motor vehicle with two twin axle trailers



D: Articulated truck with two semitrailer



E: Extended motor vehicle with semitrailer



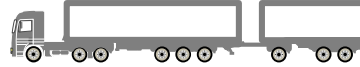
F: Motor vehicle with superstructure and trailer



G: Motor vehicle with superstructure and three axle trailer



H: Articulated truck with semitrailer and short three axle trailer



Vision

- Currently EU 'Weights and dimensions' directive of 1996 still in place, but under review
- Noticeable trend in European countries towards allowing EuroCombis or testing of these (DE, NL, FI, DK, BE, SE)
- Typical allowed mega truck lengths of 25,25m and weight of 60t except Germany with limit to 40/44t
- EuroCombi fuel consumption ~15% less per transported ton than conventional truck
- Transport volume per truck can increase by 50%
- Alignment within European Union and tightening emission regulations will lead-ing to **considerable more large trucks**

Country	Length	Weight	Use
Germany	25,25 m	40/44 t	some federal states
Denmark	25,25 m	60 t	nationwide
Netherlands	25,25 m	60 t	nationwide
Sweden	25,25 m	60 t (ab 06/2016: 64 t)	nationwide, trials with 32m/90t
Finland	25,25 m	76 t	nationwide

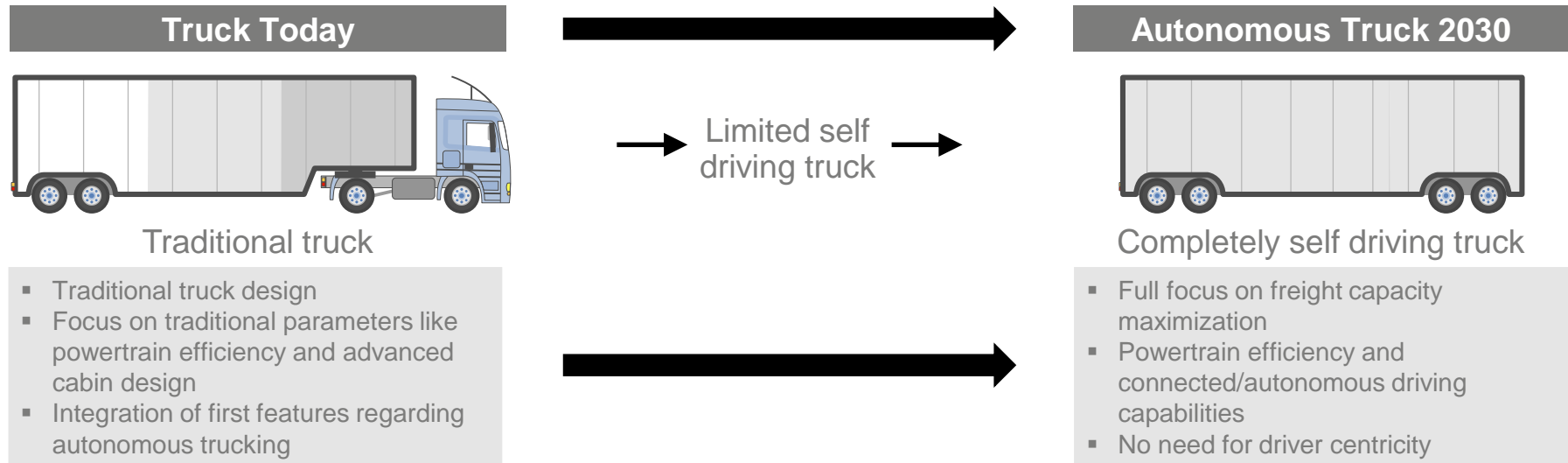
Source: Strategy& analysis

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Autonomous truck technology will change completely the truck design

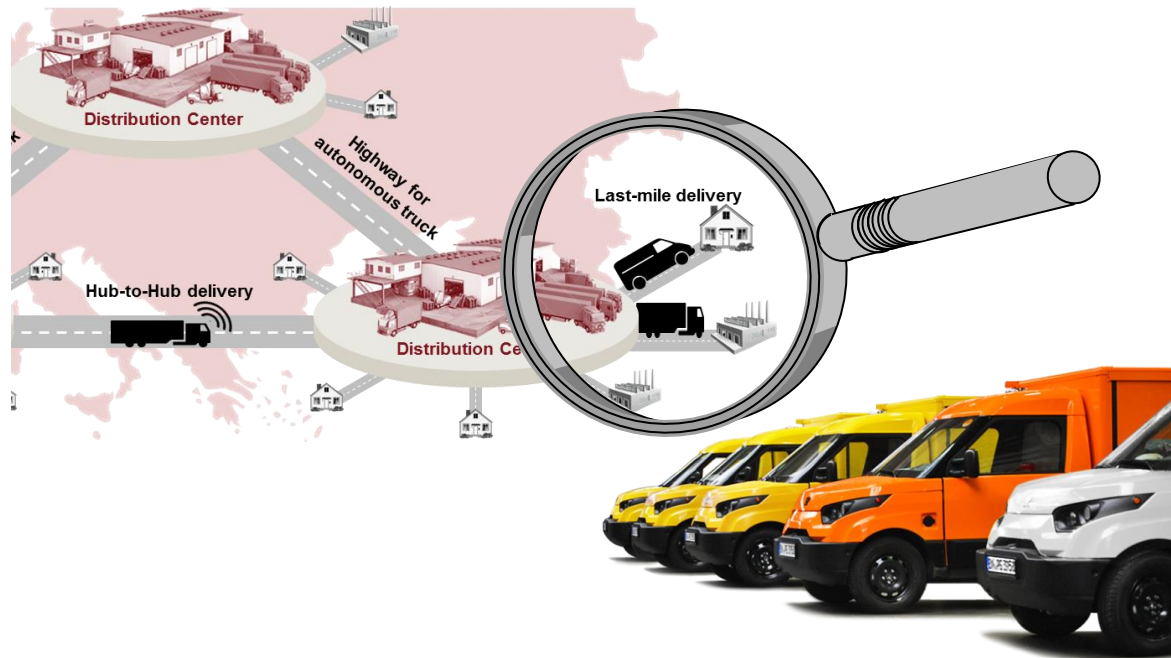
4 Autonomous Truck – Future Shape



The fully autonomous truck in 2030 will look different from current solutions as e.g. cabin will not be necessary anymore

Hub-to-Delivery will be executed by hybrid and full-electric small to medium sized trucks

5 Electric, hybrid Trucks



Vision

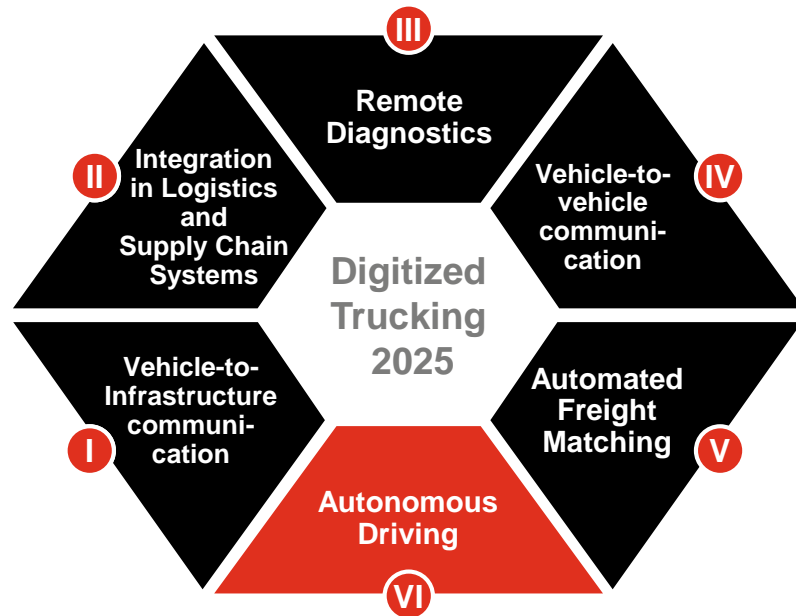
- **Last-mile delivery to end-customer** will be executed by **small-to-medium sized trucks**
- **Emission regulations** in cities seen as main **drivers** for **hybridization** and **electrification**
- Power train changes will **reduce fuel** consumption, **emissions** and general **air pollution**
- **Scale of city traffic** and **ban on certain vehicles** will prevent large trucks **from entering cities**
- Proof of concept: **DHL Group Street-Scooter**, electric delivery trucks

Source: Photo by DHL Group, Street-Scooter

We have identified 7 main stakeholder that will be impacted, but can also benefit from these trends

Overview of main technological trends and stakeholders

Technological trends



Main stakeholders

- 1 Component supplier
- 2 OEMs
- 3 Service provider
- 4 Logistic provider / trucking company
- 5 Regulators
- 6 End-user/customer
- 7 Driver



Source: Strategy& analysis

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Many possible connected service opportunities will be developed from these trends; we have selected 4 +1 business cases

Overview stakeholder Impact

PRELIMINARY

stakeholder		Technologies						
		Connected truck					Autonomous truck	
		Vehicle-to-vehicle	Vehicle-to-Infrastr.	Remote Diagnostics	Integration in Logistics Systems	Automated Freight-matching	Platooning	Full autonomy
1 Component Supplier		✓	✓	✓	✓	✓	✓	✓
2 OEMs		✓		✓	✓	✓	✓	✓
3 Service Provider		✓			✓	✓	✓	
4 Logistic Prv./Truck.Comp.			✓	✓	✓	✓	✓	✓
5 Regulators							✓	✓
6 End-user/Customer			✓					
7 Driver			✓	✓	✓	✓	✓	✓

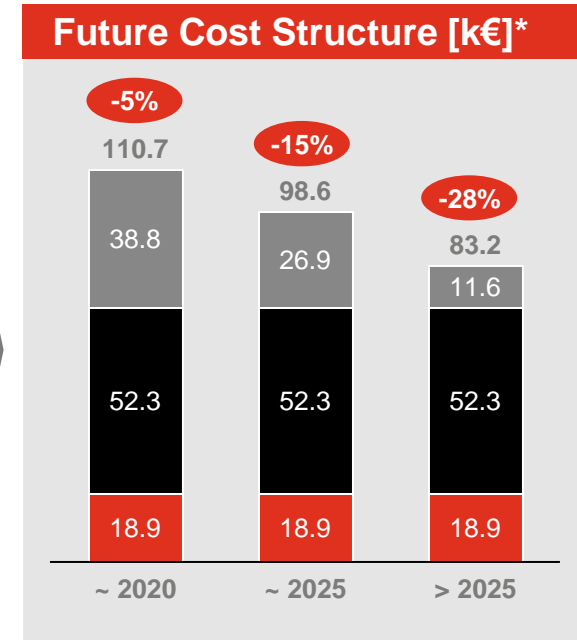
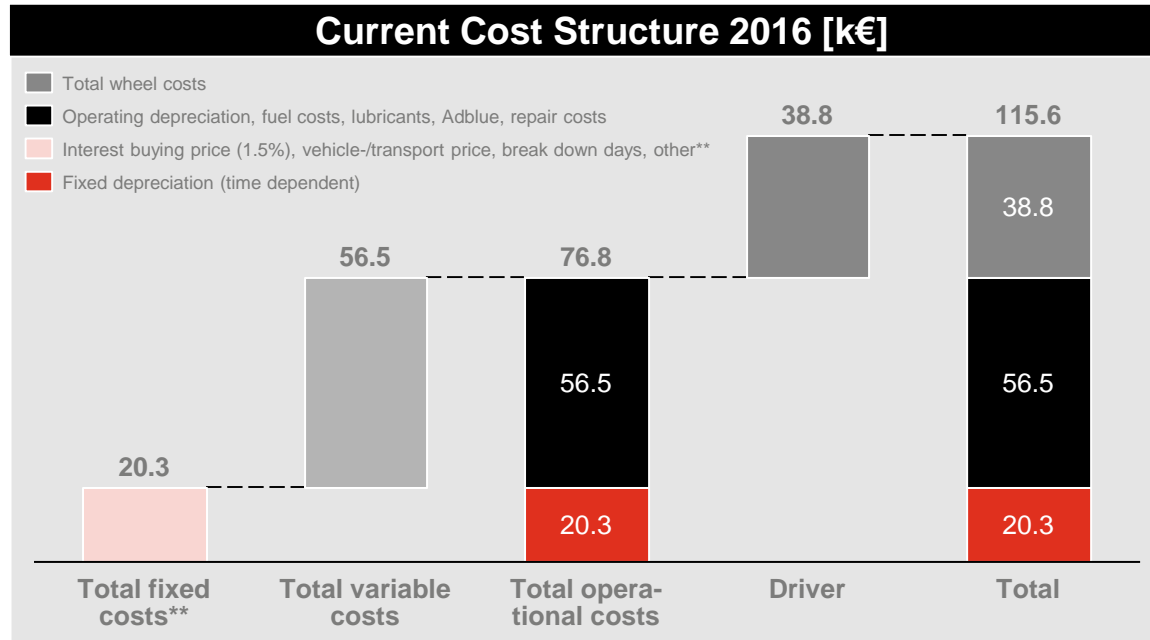
Source: Strategy& analysis

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The annual operating costs for a traditional average long-haul truck will be reduced step by step with autonomous driving technologies

Business Case 5 : Operating costs development of traditional average truck



** Additional investment and operational costs for autonomous technology is included
 ** Total fixed costs includes tax, testing costs, fixed rate for cleaning and communication costs

Remark: An annual driving basis of 140.000 km was taken
 Source: Lastauto Omnibus (05/2016), PwC Strategy& analysis

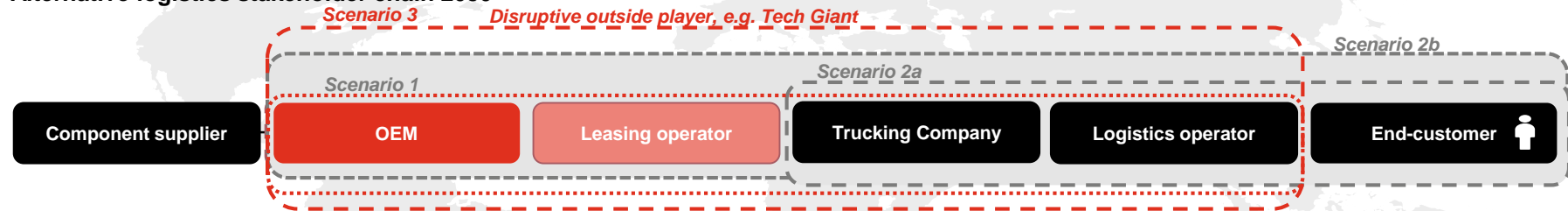
Based on predicted trends, the logistics value chain will change dramatically

Outlook: Transition of the logistic value chain

Logistics stakeholder chain today



Alternative logistics stakeholder chain 2030



Current supply chain based on **multiple distinct market players**; First overlaps are visible, e.g. **OEM as leasing provider**, but generally clear separation along the value chain

Scenario 1:
Autonomy of trucks enables OEM's participation as **mobility service provider** combining traditional services of **trucking companies** and **logistics provider** as need for drivers and manual coordination decreases

Scenario 2a:
Endcustomer will take over **parts of the logistics value chain** in order to get more control over the **hub-and-spoke network** as well as the **last mile delivery**

Scenario 2b:
Endcustomer will in some extent **expand to the design and manufacturing of specific truck solutions** in order to have tailored and **cost efficient equipment** available

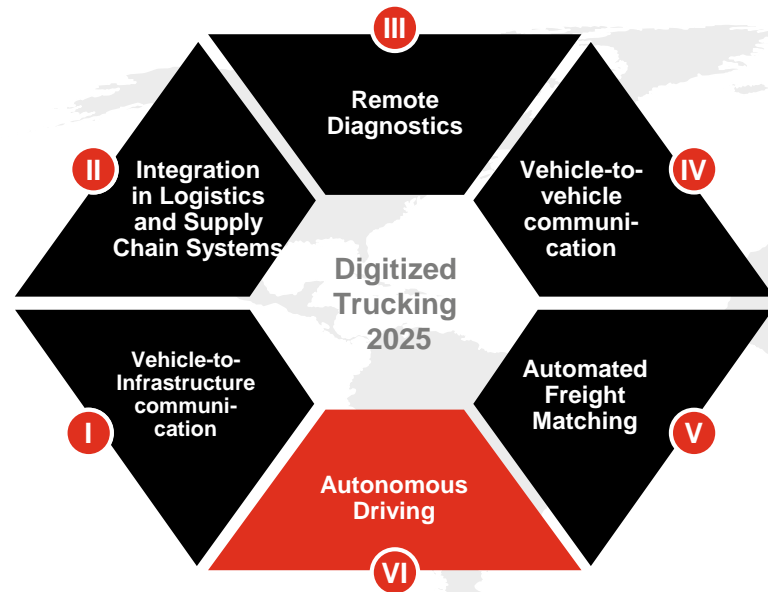
Scenario 3:
Outside Tech Giants may enter the market and occupy relevant parts of the **entire logistics value chain** causing **disruptive situations** for the **traditional players** in the value chain

Source: Strategy& analysis

Digitized trucking will lead to significant changes in the entire logistics value chain with adjusted roles of current and new stakeholders

Conclusion and Outlook

Technological trends



Main stakeholders

- 1 Component supplier
- 2 OEMs
- 3 Service provider
- 4 Logistic provider / trucking company
- 5 Regulators
- 6 End-user/customer
- 7 Driver

Conclusion and Outlook

- **Trucking cost reduction** up to **28%** by autonomous driving
- Main **saving potential** is the **substitution of driver**, but limited by **adequate regulatory adaptations**
- Development of **hub-and-spoke systems** is forced by **increased emission regulations** for urban areas and based on **autonomous trucking technologies**
- **Last-mile-delivery** will be done by **emission free midsize trucks**
- **Digitization** will **disrupt** the entire **logistics value chain** and enables the **market entry** of new **Tech Giants**

Source: Strategy& analysis

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Strategy & Impact