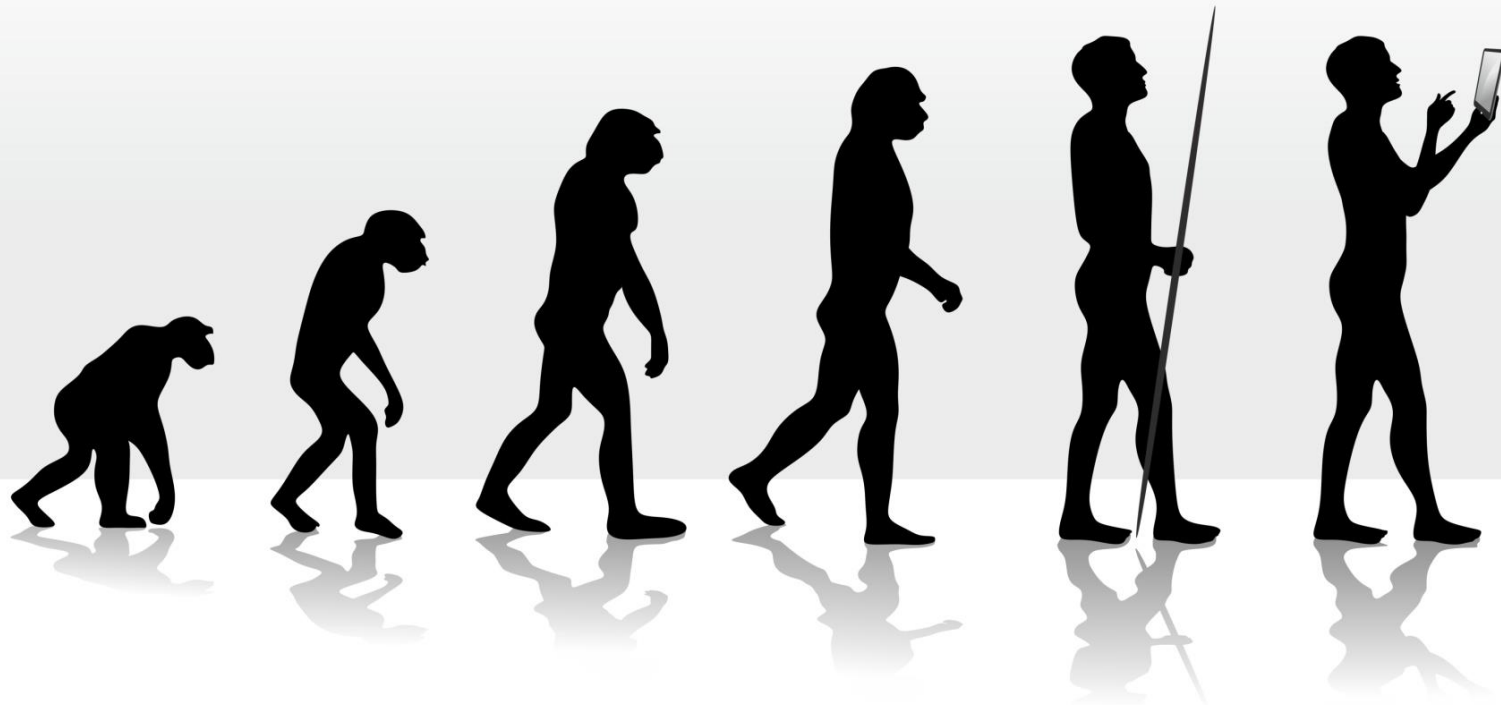




Digitalisation in the Railways

Deutsche Bahn AG | Rolf Härdi | CTO | Graz | 26.09.2017

**It is not the strongest of the species
nor the most intelligent that survives.**

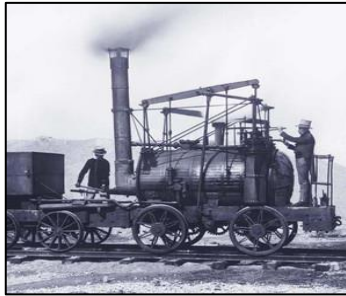


It is the one that is the most adaptable to change

Charles Darwin (1809-1882)

The Railway has traditionally transformed its operation mode following the innovation cycles of industrialisation

Steam Power (1.0)



First Steam Locomotive
„Puffing Billy“ von Hedley
Wylam upon Tyne¹⁾

Electric Power (2.0)



Erste Electro Locomotive
Siemens & Halske -
Berlin - Wernerwerke²⁾

Diesel Power (2.0)



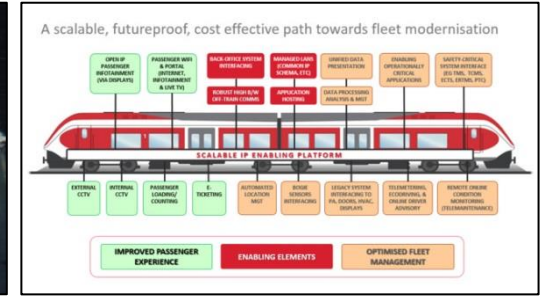
First Diesel locomotive
Ю3 001 (dieselelektrisch)
von Lomonossow in Kiew³⁾

High Speed Trains (3.0)



First High Speed Train
Shinkansen Baureihe 0
Tokio - Osaka⁴⁾

Intelligent Trains



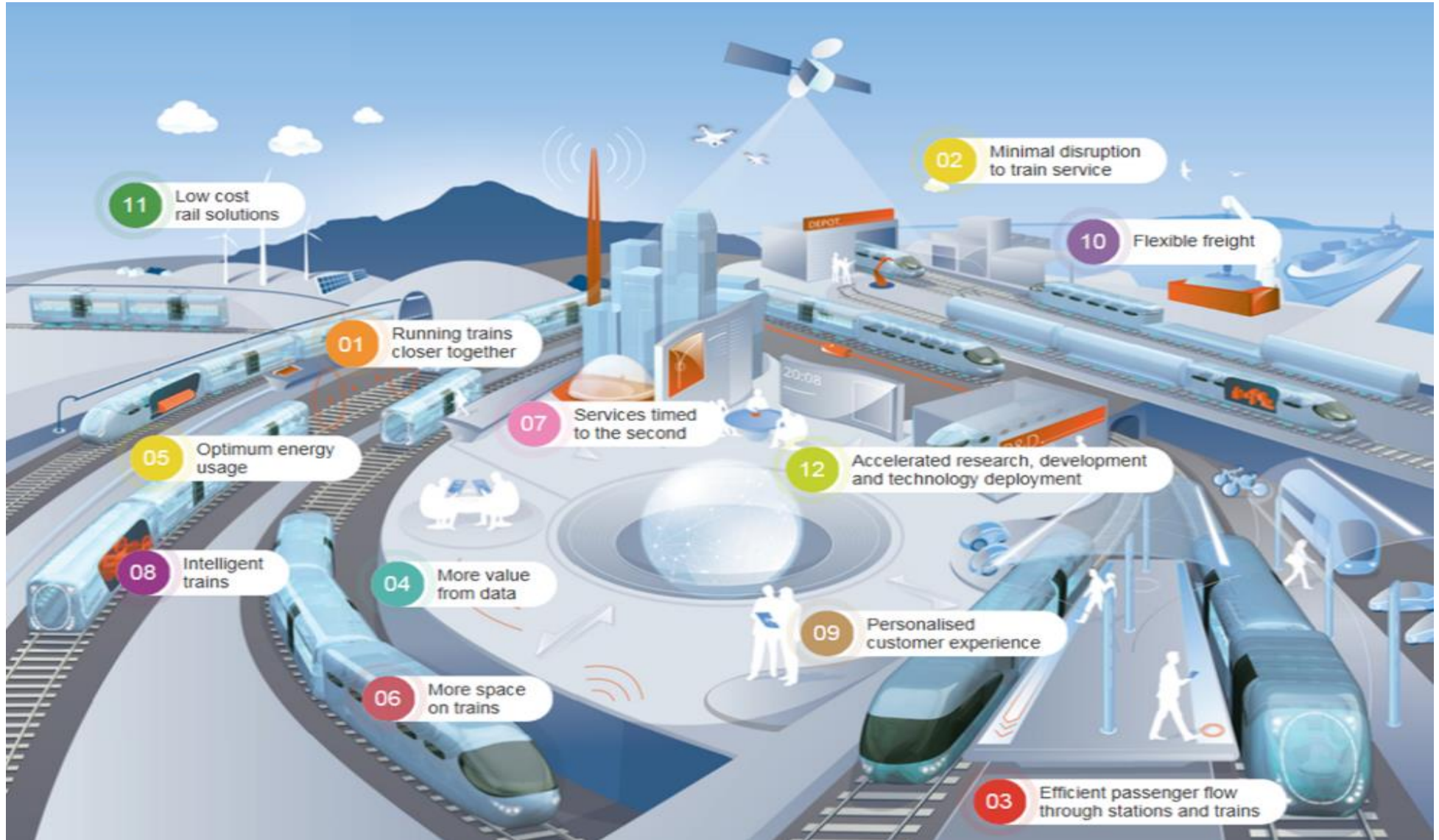
First Remote Diagnostics
London Underground
Central Line

Artificial Intelligence
CBM ... Digitalization



Smart Cities - Smart Transport

To organise the world's public transportation, making it pleasant and efficient



Focus: Passenger Experience

In the digital age a passenger is traveling seeming less, comfortable and fast from A to B



Total Service From A to B

A Journey is starting from the point, where a customer is deciding to move to a other location. Different means of transport are operating as one travel experience, ensuring the most efficient use of time and the most possible level of comfort



Passenger Guidance Systems

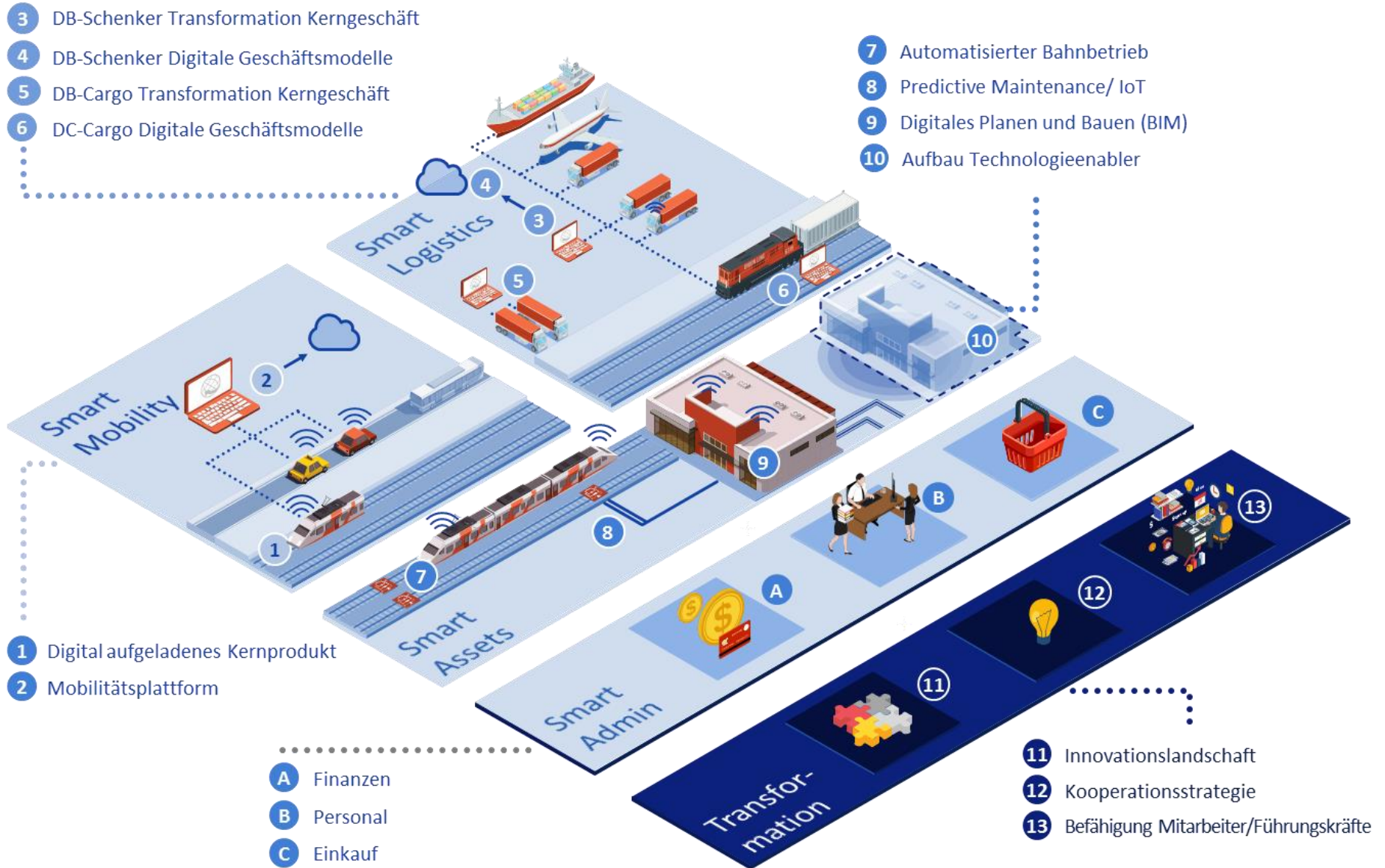
The passenger can “online” plan, buy, follow and change his travel, thus ensuring a save and convenient journey



Integration of alternative transports

Especially on the “last mile”, new means of individual transport are complementing public transport systems

DB GOES DIGITAL - Overview of the DB Digital Plan



The digital Revolution is bigger and more profound as any previous industrial changes in the industry

CUSTOMER CENTRIC

New customer requirements

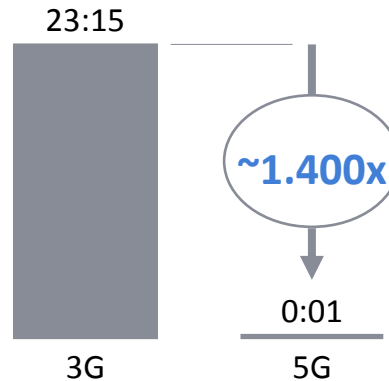
"Connected" und Personalised



DISRUPTIV

New Technologies enable new products

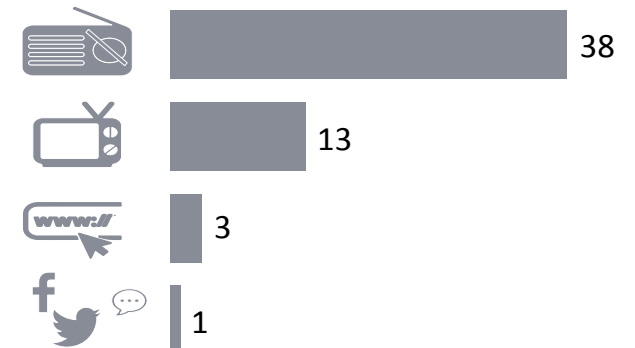
Download von 1,25 GB, in Minuten



DYNAMIC

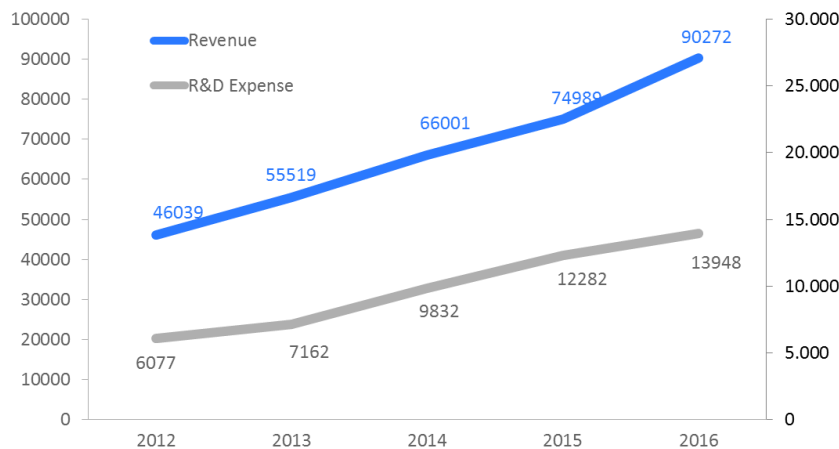
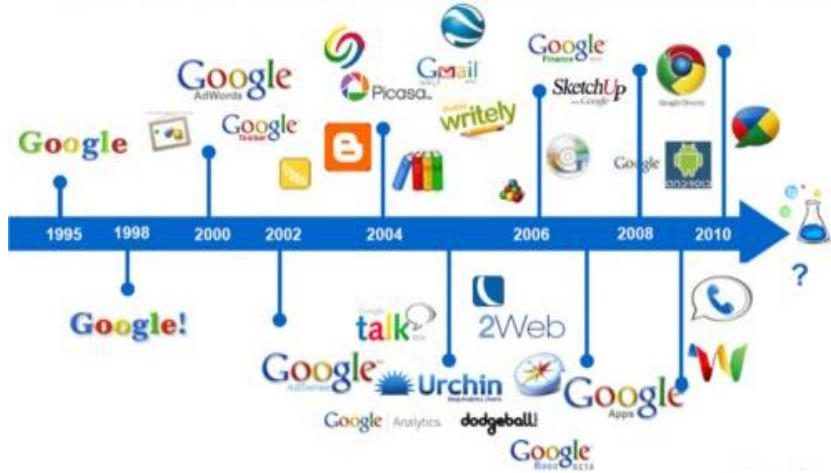
Scaling in much faster speed

Years to 50 Mio. Users



Example: Google

Business Success through continuous innovations and product development



1. Clear defined vision for innovation

„To organise the worlds information and make it universally accessible und useful“

2. Continious integration of new technologies

Thorough screening of new/ emerging technologies and integration / acquisition of start-up as well as established technology companies

3. Investition in R&D

Google is investing >15% (14 Bil. Dollar in 2016) of its yearly revenue in R&D. This is not including the technologies acquired through acquisitions

4. Thorough conversion of the Google vision

In order to ensure “useful and accessible” information, google has broadened its activities from pure analysis to creation and delivery of information

Disruptive Innovation

The theory of disruptive innovation, has proved to be a powerful way of thinking about innovation-driven growth

Disruption theory differentiates disruptive innovations from what are called “sustaining innovations.” The latter make good products better in the eyes of an incumbent’s existing customers: the fifth blade in a razor, the clearer TV picture, better mobile phone reception.



Digital Camera

Ironically, Kodak has invented the digital Camera, but shelved the innovation to protect their “core business” of making films



iPhone

The killer of the “Nokia Phone”, compact digital camera, navigation device pocket calculator ...

The iPhone is a true disruptive and very successful innovation



Hyperloop

A team of German students competing in Elon Musk's Hyperloop challenge have reached

201 mph in the latest milestone for the superfast transport system

Disruptive R&D within DB → mindbox

DB mindbox is opening the world of start-up's for DB, enabling true disruptive innovation in short time



Out of the Box - Out of DB

- Independent premises outside DB offices
- In the middle of the start-up scene located in the centre of Berlin
- Team of 12 lateral thinking employees



Approach

- Built on 3 pillars: Acceleration, Challenges, Open Data
- Concept test to start usually in-between 3 months
- Current cooperation with 27 start-ups



Examples of actual products from cooperations

- Light transmitting concrete (SUIT) is guiding travellers supporting comfort and punctuality
- Loudspeakers (HOLOPLOT) for clear understandable platform announcements
- Smart Point Sensors (KONUX) for increased availability



New Format: Hackathons to unleash the power of digital data

Making digital data accessible to experiment on new business models



Hackathon supporting the DB Data Community through ...

- ...promotion of cross system data analysis for new services and business models
- ...Colaboration at equale level with external innovators and developpers
- ...Triggering of new business models

Free Participation

100+ Participants

Release of new Data Sets

24 Hours (Fr-Sa)

Inspiring Location

Setting themes und matching Challenges as Inspiration

Voluntarry Participation with open results

Projects for Customers

Projects for internal Prozesses

Projects for New digital business

Digital Rail

The vast opportunities are endless – however we are using only a fraction of it

Today usage

First applications of the digital railway are in implementation

- Condition based Maintenance (Vehicle- and Infrastructure side)
- Digital Travel Apps
- Driver assistance systems
- Intelligent Network guiding systems

Unused Potential

We are facing the challenge of a fragmented and chaotic data jungle

- Every company is developing and protecting its own digital system
- Data ownership and responsibility is not regulated
- Train integrators, Subsystem manufactures and operators are competing on digital data dominance
- No agreed European / interoperability approach
- No true cross functional/ open data approach
- No legal foundation for data exchange



Data Volume - Data Structure

An increasing data volume is requiring a standardised hierarchical data structure

The ICE with 149 computers is producing more than 750 MB/Train/Day



DB with 265 ICE's alone is producing 200 Gigabyte per Day → 73 Terabyte per year

Data Lake

A data lake is a storage repository that holds a vast amount of raw data in its native format



Data Warehouse

A data warehouse stores hierarchical data in files or folders



Not only Digitalisation

The digital age is revolutionising the railway, but many traditional challenges do remain

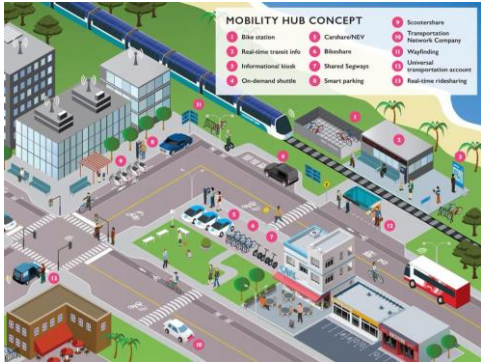
There is a wide range of growth opportunities through innovation, also in the more traditional fields

- Wheel - Rail Interface
- New materials
- Self cleaning surfaces
- Air flow - aero dynamics
- Insulation of noise and climate
- Passenger comfort
- Energy efficiency
- Processes
- Infrastructure
-



Summary

Key messages from the paper



Smart Transport

Digitalization must lead to a seeming-less integrated, pleasant, economical and efficient travel experience for passengers and goods



Disruptive Innovation

Established companies are exposed to loose focus on real innovations, therefore a continuous disruptive and open data innovation culture is required



Managing the Data

The increasing amount of data must be structured. An European approach to share and regulate the usage of data is required



Not only Digital

The challenge to make public transport more convenient and efficient is broad with many mechanical, chemical, procedural and electrical topics

Thank You

