Deutsche Bahn – Digital Transformation and Long-term Challenges
“We are facing the most radical CHANGE since Rail Reform.”
Digitalization affects all of DB's activities - keeping up with the speed of innovation is challenging

**Online booking** platforms may substitute classic forwarder business

**Autonomous trucks** will increase competition to rail cargo transport

**3D-printer** will reduce the demand of cargo transport

**Low Cost & Sharing** will increase competition for rail passanger transportation

**Digital life companions/devices** may lead to loosing the customer interface

**Autonomous cars** will reduce the attractiveness of rail transport and cause higher pollution
Pressure on profitability from intermodal competition is increasing with digitalisation – example DB Bahn Long Distance

**EBIT DB Bahn Long Distance** (Mio. EUR)

- 2009: 145
- 2010: 121
- 2011: 170
- 2012: 373
- 2013: 326
- 2014: 216
- 2015: 225
- 2016:
- 2017:
- 2018:
- 2019:
- 2020:

**Growth**

**Massive changes in the market**

- Long distance buses
- Platforms, sharing
- Low-cost airlines 2.0
DB is taking digitalization as a great opportunity – many initiatives launched

DB has launched a number of initiatives:

- Mobility 4.0
- Logistics 4.0
- Infrastructure 4.0

Examples:
- New mobility products and services and networking across modes
- Digital customer interfaces and live information
- Digitalization of production processes
- Research partnerships and labs
We have identified three comprehensive clusters for digitalization at DB – and launched a range of projects and activities

**Major objectives**

<table>
<thead>
<tr>
<th>Customer centricity</th>
<th>Operational excellence</th>
<th>Innovation culture</th>
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<tbody>
<tr>
<td>Neutral multimodal mobility platform <strong>Qixxit</strong></td>
<td><strong>TechLoc</strong> as an online diagnosis tool for locomotives</td>
<td>Establishment of <strong>d.lab</strong> for prototyping mobility services</td>
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<td><strong>Next-generation eServices</strong> based on app technology for logistics services</td>
<td><strong>Virtual planning</strong> and control of infrastructure construction projects</td>
<td><strong>Enterprise Lab</strong> for Logistics &amp; Digitization set up by DB Schenker and Fraunhofer</td>
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<td><strong>Digital schedule</strong> and semi-automated train-path allocation</td>
<td>Maintenance using <strong>digital devices</strong></td>
<td><strong>Start-up bootcamp</strong> – Collaboration with start-up accelerator</td>
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Mobility 4.0
Until 2025, mobility will change…

- Low price mobility and sharing
  - Low low price mobility will be established
  - Sharing offers as part of regional and urban mobility

- Autonomous cars
  - Flexible and individual mobility on highways
  - First prototypes of Robo-cabs

- Digital journey
  - Total supply transparency
  - Digital personal assistant influences mobility choice

… driven by digitalization
DB Bahn systematically aligns product and service design with customer needs along their journey.

Product design aims at complying with unsatisfied and latent customers needs.
Customer needs analysis indicates that four factors aside from basic quality impact the DB customer experience:

- **Convenient**
- **Personalised**
- **Efficient** (incl. price/speed)
- **Sustainable** (on-time, clean)

**Aggregated experience factors**

- **Enriching**

**Aggregated basic factors**

- **Straightforward**

Source: Study by DB Long Distance and DB Sales, 2014

Deutsche Bahn AG | Mobility 4.0
Customers already benefit strongly from strong digital platforms and applications

Examples from DB Bahn

- Online ticket
- Mobile phone ticket
- Call a Bike app
- Qixxit
- DB Navigator
- Flinkster app
Full mobile connection of passengers requires further investment in telecommunication infrastructure and rolling stock.

Mobile access: technical pre-requisites and options

Telecommunication infrastructure

- **3G/4G**: Direct connection
  - Immediate reception of mobile signal, depending on rolling stock design

- **3G/4G**: Repeater
  - Strengthening of outside signal, and passthrough to passengers' mobile devices (voice, data)

- **3G/4G**: WiFi
  - Creation of a WiFi network inside the train, optional free log-in (data only)

Rolling stock equipment

... relevant players in regional passenger rail, e.g.:

Source: AT Kearny 2015

Deutsche Bahn AG
DB Schenker addresses digital transformation through Logistics 4.0

Target picture: Logistics market of the future
- Key developments
- Business models
- Competitive landscape

Product of the future
- New digital solutions
- Customer interface of the future

Optimized processes & assets
- Asset intelligence
- Workplace of the future
- Data analytics

Enablers
- DB Schenker Labs
- Research cooperations
- Customer innovation projects
Eight key developments in digitization will shape the future of transportation and logistics

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<th>Customer interaction</th>
<th>Digital platforms</th>
<th>E-commerce</th>
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DB SR will consistently pursue its innovation activities aiming at Automated Train Operation for rail freight

Automated train operations examples

- Automated metros running worldwide
- "It’s not a lack of technology that’s keeping trains from going driverless."
- In 2015, AutoHaul creates the world’s first fully-autonomous heavy haul, long-distance railway for iron ore transports in Australia

Chances for DB Schenker Rail

- Auto pilot
- Obstacle detection
- Self-diagnosis
Reducing complexity in customer-visible areas – customer driven, easy and digital

Digitalization and simplification

Low complexity

BackBone
Operational excellence

Finanzierung
Kapazitätsmanagement
Regelwerke
Topologie & Ausstattung
Grünschnitt
Regulierung

IT-Schnittstellen
Belegung
Fahrplan
STN / NBS
Stellwerksbesetzung
Infrastrukturentwicklung
Grenzlasten
Politik

Frontend
Reduced complexity

Angebot

Einfachbahn-criteria:
Customer driven
Easy and intelligent
Digital

Finanzierung
Kapazitätsmanagement
Regelwerke
Topologie & Ausstattung
Grünschnitt
Regulierung

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Full complex

Low complexity

Customer driven
Easy and intelligent
Digital

DB Netz AG – European Corridor Management (I.NMC)
Terms of references for rail is by far more complex than for Inland waterways and for Road.

Status quo: Complexity of German rail system

- Rail (=DB Netz AG): 32,000 pages
- Inland waterways: 2,845 pages
- Road: 1,081 pages

1) Terms and Conditions, Policies, Rulebooks etc.
DB Netz AG - European Corridor Management (I.NMC)
Digitalisation of timetabling is a competitive boost to the rail system: click and ride, the customer simply "drives off straight away"

Project example: neXt

Vision of future customer interface (especially freight transport)

"Digitalised" rail system

Strengths:

- High degree of planning certainty (each train has a place in the timetable)
- One of the safest modes of transport
- Positive environmental footprint compared to lorries/cars
- Access is quicker, easier and more transparent

- Customer has direct online access to available train paths
- Data is in real time and processed rapidly
- Track request and actual train run can be almost "simultaneous"

Source: I.NMF
Deutsche Bahn AG
The Mayday app – an example of how digitization can be used in maintenance

Project example: Mayday Button

**Maintenance worker**

- Cause and solution of disturbances not always immediately identifiable
- So far, only telephone assistance possible by experts

**Expert**

- Maintenance App with **Mayday** button connects maintenance worker on site quickly and easily with a real expert
- More effective and rapid breakdown repairs by sharing photos, plans and videos
- Increase employee and customer satisfaction through successful suppression

**Expert supports** with detailed knowledge of breakdown repairs

**Expert** has access to additional information and documents

Quelle: IC, I.NPS
DB Netz AG – European Corridor Management (I.NMC)
Use of digitalisation to improve infrastructure availability (e.g. with remote diagnosis tool “DIANA”)

Project example: DIANA

- Availability of telecoms components
- Availability of signalboxes
- Overhead line predictions
- Modular bearer
- Heating elements in points
- Condition of bridges
- Monitoring of points

**DIANA diagnosis tool** already implemented. Enables early repair of point failures and thus **reduces downtime**

- Convenient **sensor technology facilitates early prediction of** failure probability and maintenance requirements
- **DIANA tool** already in rollout, design underway for further components

Source: I.NPS 41
Deutsche Bahn AG
The digitization map shows the main topics of all 4.0 initiatives regarding digital transformation at Deutsche Bahn AG.
DB digitally transforming

Conclusions

- **Why?**
  - Customer centricity
  - Operational excellence

- **Achievements?**
  - Top awareness, strong visions, change of culture
  - Large number of entrepreneurial initiatives and projects

- **Regulatory implications?**
  - Change of relevant markets
  - Digitalization of regulators

- **Open/long-term challenges?**
  - Attractiveness of products!!!
  - Big data analysis
  - Connectivity and cyber-security
  - Automisation (infrastructure/train operations)
  - Simplification and digitalisation of documents