Organizing digital mobility

Digital acceleration in the rail industry

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1 The digital disruption is happening all around us, and it is happening now

2 Digital is disrupting the way we need to think about delivering on our transportation mission

3 Progress is underway, but we must accelerate

4 That journey starts today
Technology is disrupting every aspect of our lives
Disruptive technologies are rapidly changing the composition of industry

Top 5 publicly traded companies by market cap

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<tr>
<th>#1</th>
<th>#2</th>
<th>#3</th>
<th>#4</th>
<th>#5</th>
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</thead>
<tbody>
<tr>
<td>Exxon</td>
<td>GE</td>
<td>Total</td>
<td>Microsoft</td>
<td>Citi</td>
</tr>
</tbody>
</table>

2006

2016

Tech

Other

1 By market cap

SOURCE: Visual Capitalist
Industry after industry get disrupted, and the travel and transportation industry is no exception.

Digital has changed entire industries.

Initial changes already visible in TTL (despite regulation and asset intensity).

SOURCE: McKinsey & Company
DIGITALIZATION – Much more than just technology

Transformation

“Each product is a (digital) service just waiting to be realized.”
MEDIA – A FIRST MOVER

ICT MEDIA 23%
Streaming music, on-line games, web & IP TV, web news, media apps, etc.

Media
Transport
Utilities
Health
Etc.
Reconfigure or be reconfigured – Rail as prime mover..?

Virtual/digital world of dematerialised assets

"Offering Design"

"Prime Mover"

"Innovator"

Local world

Global, geographical unlimited world

"Train operator"

Traditional company

Value chain - logic

World of physical assets

Reallocation Time/Space
1. The digital disruption is happening all around us, and it is happening now.

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4. That journey starts today.
You don't need a digital strategy.
You need a **business strategy for the digital age**
6 disruptions could fundamentally change the travel and transportation industry

- **Online platforms**
  - "Traditional TTL companies as capacity providers only?"

- **Expansion of large technology companies**
  - "Fear of the hungry tech giants?"

- **Advanced robotics**
  - "Fundamental changes to cost structures?"

- **Asset sharing**
  - "The door opener for innovative startups in the industry?"

- **Autonomous vehicles**
  - "Cost structures, opportunities, competitors – will everything change?"

- **Additive manufacturing**
  - "The 'big hit' to the logistics industry?"
Rail has still not seen significant disruption, but it could be a matter of time before transportation becomes a utility.

Our ultimate goal is to build a network of transportation as reliable as running water, everywhere for everyone. — Kalanik, Uber CEO

One asset network – many applications

<table>
<thead>
<tr>
<th>Asset Network</th>
<th>Applications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Very high</td>
<td>Taxi industry, Courier service</td>
</tr>
<tr>
<td>High</td>
<td>Auto rentals, Car-sharing industry, Automotive industry, Express, parcel delivery providers</td>
</tr>
<tr>
<td>Possible future target?</td>
<td>Freight logistics</td>
</tr>
</tbody>
</table>

What other unused or underutilized assets are there? Which sharing models are conceivable?

SOURCE: Uber Web site; press reports
Increasingly autonomous vehicles could have significant impact on passenger rail modal share

**Partial automation**
- System controls steering and acceleration/ deceleration – driver still in charge
- Reduces accidents
- Available today

**Highly autonomous Drive**
- System executes all driving tasks for majority of driving – not relying on driver to be able to intervene
- Frees up driver time
- Likely available ~2020 - What all premium OEMs aim for

**Full automation / driverless**
- Automated transportation from A – B – No steering wheel required
- Will completely change urban mobility
- Likely available ~2020 – Focus of tech players
The opportunity from digital is immense: increasing punctuality through big data analytics and IoT would have deep impact on the railways' profit…

### Financial impact

- **Cost**: 2-3 percentage points
- **Revenues**: 5-7 percentage points
- **Profit impact**: 7-10 percentage points

### Rationale

- Increased operating costs for energy and staff
- Increased requirements for operating capital (more locomotives and rail cars)
- Increased staffing requirements
- Loss of income due to reduced attractiveness of the railway
- Penalties or reduction of ordering party's fees
- Refunds of ticket price

**CASE EXAMPLE**

Regulation on rail passengers’ rights by European Union

**SOURCE**: McKinsey & Company “Punctuality in Rail”
… as would improving system design and fleet management through advanced analytics

1 European operator

SOURCE: McKinsey & Company “Passenger Rail - Steaming Ahead into a Bright(er) Future”
Internet of Things
Enabling technologies

Monetization of Service
Applications & Analytics
Cloud & Connectivity
Devices & Sensors

Manufacturing  Energy  Transport  Public Safety  Health—care  Media  Telecom Operators  Other industries…..
IoT is expected to enable significant value in transportation

**Proactive, remote diagnostics**, can improve efficiency of workshops by 5-10%

**Platooning** can reduce fuel consumption by 4-8%

**Predictive maintenance** can reduce annual R&M spend by 10-40%

**Optimizing vehicle specifications** with a configurator can reduce fuel consumption by 5-10%, R&M costs by 5% and save 15% of sales reps time

**Data monetization**
Collecting and reselling big data to third parties

**Driver assistance** systems can reduce number of collisions by 25%¹

¹ Based on passenger car data

SOURCE: McKinsey Global Institute
A BROAD SPECTRUM OF REQUIREMENTS

Massive IoT-communication

- Low cost, low energy
- Small data volumes
- Massive numbers

Critical IoT-communication

- Ultra reliable
- Very low latency
- Very high availability

Applications:

- Logistics, tracking, and fleet management
- Smart building
- Smart agriculture
- Capillary networks

- Remote health care
- Traffic safety & control
- Industrial application & control
- Remote manufacturing, training, surgery
Keep unwanted traffic at bay
Building trustworthy clouds
Usable and scalable security
Device and platform security
Identity management
Data integrity
Security assurance
Security for big data
Insider threats
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Digitalization is underway; maturity varies by industry, but most potential is yet untapped

<table>
<thead>
<tr>
<th>Industry</th>
<th>Digital Maturity</th>
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<tbody>
<tr>
<td>Airlines</td>
<td></td>
</tr>
<tr>
<td>Hotels</td>
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<tr>
<td>Car rental</td>
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<tr>
<td>Mail, courier, express, parcel delivery providers</td>
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<tr>
<td>Contract logistics providers</td>
<td></td>
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<tr>
<td>Rail</td>
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<tr>
<td>Freight forwarders and carriers</td>
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- Efforts to date have mostly digitized the business “as-is”
- Organizations either haven’t recognized the real digitalization opportunities yet, or aren’t capable of implementing them
The rail industry may soon face the tipping point of the digital lifecycle.
Exciting progress exists, for example new mobility services aiming to satisfy customers' mobility needs by offering seamless end-to-end services across all transport modes.

- A diverse set of players have invested in these solutions, from traditional rail companies to car manufacturers to independent start-ups.

- As mobility integrators, these players are building upon an ecosystem of partners.

![Diagram showing integration of all transport modes and steps in the customer journey](image-url)
MOBILITY-AS-A-SERVICE

ONE-STOP-SHOP FOR TRAVEL SERVICE COMBINATIONS

TRAVEL NEEDS
- Commute to work
- Commute to school
- Business trips
- Visit friends and relatives
- Travel to events
- Travel to sporting activities

TRAVEL SERVICES
- Rent
- Pool
- Share
- Taxi
- Public transport
- Rent

Simplicity

Your Mobility-as-a-Service broker

New and more loyal customers

ADDITIONAL SERVICES
- Travel guarantee
- Bonus programs
Data-integration platforms consolidate transport data across providers and modes, supplying mobility services providers with coherent data sets.

Data can be accessed by all mobility services providers and displayed across all channels.

- **Cost savings**: Information channels (from stations to apps) benefit from centralized provision.
- **Complete data**: Data from all public transport operators in the country, across modes.
- **Consistent data**: Access to one central database prevents inconsistencies across channels.
- **Quality-assured**: Complete, consistent, current plan, real-time, and infrastructure data.

**Public transport data-integration platform**

- **Trip data and vehicle characteristics**
  - High-speed rail
  - Regional train
  - Rapid transit
  - Bus
- **Infrastructure data**

**Mobility services providers**

- **At the station**
- **On trains**
- **On digital channels**

**Competition focuses on user experience, not on data access**
In some European countries, public transport information platforms have already been built up – in others, platforms are currently being crafted.

- Transit concession contracts require all rail companies to provide data.
- Raw data (plan, real-time, delays) available to everyone at no cost; routing data for a small fee per request.
- Public transport companies incentivized to provide data (voluntarily).
- Raw data (plan, real-time, fares) available to everyone at no cost; routing data for a fee per request.
- Public transport companies voluntarily provide data.
- Raw data and routing data available to everyone at no cost (real-time data not public).
- All public transport companies legally required to provide data.
- Raw data (plan, real-time) available to everyone at no cost as of 12/2016.

Start-ups use the open public transport data for travel applications that encourage the use of public transport: UK example

**Value proposition**
- Visually presents the time needed to reach a particular location
- Measurable advantages for companies include, e.g., higher conversion rates – for instance, 300% conversion improvement for real estate portal Zoopla

**Product**
- **TravelTime**: B2B interface that shows the shortest route to a destination or the radius that can be reached within a specified time
- **MinuteMapr**: B2B tool for analyzing locations in terms of their reachability

**Modes**
- Walking, bicycle, car/taxi, public transport, and rail

**Simplifies navigation in complex cities**
- B2C: App for selecting the fastest real-time route within large cities
- B2B: Interface for companies that need real-time routes (e.g., Foursquare)

**Enables mobile purchase of electronic tickets**
- Especially relevant for cities without a modern ticketing system

**JustRide**: Cloud-based system for buying public transit tickets electronically
- Offers users access to schedules and allows transport companies to analyze sales transactions in real time

**Public transport, rail, ferry**

SOURCE: McKinsey & Company; company information; press reports
Real-time monitoring is setting a new standard for cost efficient rail reliability

- Siemens maintenance for 26 Velaro E high-speed trains (Spain)
- Punctuality benchmark **>99.9% on-time rate** (ticket refund if >5 min delayed)
- **State-of-the art real-time monitoring** leads to
  - Extremely **high reliability and availability** of trains
  - **Cost efficient service delivery** from optimized utilization of staff and extended lifetime of parts

**SOURCE:** McKinsey & Company

- **Real-time monitoring** of operating conditions (e.g., sensors for bogie vibrations, temperature)
- **Codified data transfer** via GSM
- **Computerized maintenance management system**
  - E.g., temperature based anomaly detection

**Proactive order of spare parts**
**Demand-oriented mgmt. of personnel and sites**
**Prolonging repair intervals** based on current condition
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We in the railway industry need to take advantage of the disruptions and capture the opportunities.

Disruptive technologies that…

… ease consumers’ life…
- more convenient,
- Quicker
- Cheaper
- higher quality

…and disrupt companies operations
- Enhance customer access
- Reduce cost
- (Dis-)intermediate
- increase transparency

Adapt to Digital Disruptions

New products & services
New business models
New competitors

Digitize your Core

Digital customer interaction (front office)
Digital end-2-end processes (back office)
Data-based decisions and big data
New role for Train operators
"Prime Mover" – Organizing Digital Mobility

- Mobilizing many and new competencies
- Setting new rules of the game
- Vision of the new system

- Playing with the existing rules of the game
- Few and traditional competencies

Supplier

Prime Mover
7 learnings from successful responses to technology responses

1. **Be unreasonably aspirational**
   - Board-level digital “owner”
   - A stretching and coherent digital vision
   - Value-oriented targets, i.e., digital P&L

2. **Acquire new capabilities**
   - Buying scarce talent en masse
   - Moving into adjacent markets
   - Hiring for skills, not industry experience

3. **Ring-fence and cultivate talent**
   - Protecting digital talent from business as usual
   - Digital talent management
   - Aligning organization to architecture

4. **Challenge everything**
   - Challenging the status quo
   - Going your own way
   - Involving regulators in change

5. **Be quick, agile, and data driven**
   - Continuous proposition iteration and live beta
   - Golden source of truth
   - Clear and tangible KPIs measuring success

6. **Follow the money**
   - Identify and secure strategic control points
   - Zero-base tech budget aligned with value at stake
   - Investing in digitization across the value chain and scale quickly

7. **Be obsessed with the customer**
   - Learning from every interaction with the customer
   - Relentless iteration of customer experience

SOURCE: McKinsey & Company
### How we can get started on the journey

<table>
<thead>
<tr>
<th>Discover</th>
<th>Design</th>
<th>Deliver</th>
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<tbody>
<tr>
<td><strong>Shape digital ambition, strategy, and business case based on insights</strong></td>
<td><strong>Reinvent and prototype new capabilities and breakthrough journeys as part of a program</strong></td>
<td><strong>Activate an ecosystem to rapidly deliver at scale</strong></td>
</tr>
</tbody>
</table>
| **Sector-level insights**  
- Customer insights  
- Industry developments  
- Sources of disruption  
- Do’s and don’ts | **Inspiration for digital vision and strategy**  
- Best practice examples  
- CDO network  
- ‘Go and see’ safaris  
- Hackathons  
- Aspiration workshops  
- Board/CEO aspiration setting | **Core: Customer experience and E2E processes**  
- End-to-end process redesign  
- Go to market approach | **New frontiers**  
- New business build plans  
- Getting off the ground  
- Manage core v non-core | **Foundations: Digital-ready organisation**  
- Structure  
- Talent  
- Metrics / incentives  
- Processes  
- Culture  
- Top mgmt. commitment | **Effective, tech-agnostic PMO**  
- Seasoned change managers  
- Fully IT-agnostic  
- Top talent deployment | **Global network of partnerships**  
- Platforms  
- System Integrators  
- Niche players | **Proven capability-building**  
- Capability-building centres  
- On-site coaching  
- “D-BOT” – Digital Build, Operate, Transfer | **Deep internal capabilities**  
- Digital Labs  
- Specialist acquisitions | **Advanced Analytics**  
- Use case delivery |
| **Company-level benchmarking**  
- Digital Opportunity Scan  
- Digital Capabilities  
- Best practice sharing | **Foundations: Enterprise architecture**  
- Validated design principles  
- Business-first approach  
- Pragmatic road-mapping | **Advanced analytics**  
- End-to-end use cases  
- Foundations | **De-risk**  
| **Structure the change program, resources, and commercial models to reduce operational and financial risk** | **Structure the change program, resources, and commercial models to reduce operational and financial risk**  
- Go for impact  
- Thoughtful sequencing to enable self-financing  
- Make successes visual |
The biggest risk is not taking any risk.

In a world that is changing really quickly, the only strategy that is guaranteed to fail is not taking any risk.