The Future of Rail 2050

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Neal Mumford
Arup
Foresight + Research + Innovation

Arup Rail

The Future of Rail 2050

• The World in 2050
• User Journeys
• Case Studies

http://www.arup.com/markets/rail
http://thoughts.arup.com/
http://inside.arup.com/
Contents

• Challenges facing the rail industry
• Future of Rail 2050 story
• Customer focussed approach
• Predicting the future
There needs to be a more concerted effort to introduce automation on mainline railways.

Not even all new metro lines open with unattended operation despite the huge benefits in terms of operating technologies which are worth pursuing, and the fact that Shift2Rail embraces railways and suppliers as well as

David Bignell

db@railjournal.co.uk
Technology disruptors in transport
Transport Infrastructure Series - Register now

Overview

With an expanding population, ageing infrastructure, and crippling congestion – Australia’s major cities are reaching breaking point.

To address these issues, governments and business are increasingly relying on innovative technology solutions in the delivery of transport systems that create smarter cities, drive productivity, and enhance customer-centric travel experiences.
TfNSW to trial credit card ticketing in 2017
BIM
BBC News - Italy
The Future of Rail 2050

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Megacities

<table>
<thead>
<tr>
<th>Year</th>
<th>Percentage of Population in Urban Areas</th>
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</thead>
<tbody>
<tr>
<td>1900</td>
<td>2 in every 10 people lived in an urban area</td>
</tr>
<tr>
<td>1990</td>
<td>4 in every 10 people lived in an urban area</td>
</tr>
<tr>
<td>2010</td>
<td>5 in every 10 people lived in an urban area</td>
</tr>
<tr>
<td>2030</td>
<td>6 in every 10 people will live in an urban area</td>
</tr>
<tr>
<td>2050</td>
<td>7 in every 10 people will live in an urban area</td>
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</tbody>
</table>
Demographic Change

Ageing population
- 20% of the world's population > 60 years old
- 11% today

50% of population moved into middle class
Climate Change

Potential increase in frequency and intensity of extreme weather events

- temperature changes
- storms
- sea level rise

Reductions in emissions of greenhouse gases
Smart and Integrated Mobility

International Transport Forum =>

- Passenger mobility will increase by 200 to 300%
- Freight activity will increase by 150 to 200%

Intelligent and more integrated systems

Big Data and the internet of things

Smart communications

Personalisation
Technology

New materials

- 3d printing
- Intelligent robots
- Swarm robotics
- New forms of transport
Energy & Resources

- Growing demands on energy & resources
  - Global resource consumption could triple
  - Circular economy
  - Alternative forms of fuel
User Journeys

Hugo Dupont arrives at the Office

Anna Green remotely controls the Freight train that glides past Nuno's house, while he sleeps

Nuno Tavares arrives home soon after Hugo's parcel is delivered.

Marina Aliyev

The Nakamuras

The Khosla Family

The Khosla Family arrive at the nature park

Nuno Tavares

Marina gets into the same driverless pod that the Khosla family alight from when they arrive at the station.

The Nakamuras travel in the same carriage as the Khosla family

The Khoslas arrive at the station as they board the train. Vijay drops his toy. Nuno picks up the toy.

Hugo's parcel is loaded onto the same train that Marina takes to her meeting.

The Khoslas arrive at the station. As they board the train, Vijay drops his toy. Nuno picks up the toy.
Hugo Dupont, 31
Smart City Engineer

Travelling to work

- Wearable computers
  - Wayfinding
  - Holographic communications
  - Real time health monitoring

- Send a package to friend
  - Automatic routing
  - Underground freight pods
  - Mail carriage on HS train

- Virtual shopping wall

- Frequent driverless metro
Marina Aliyev, 41
Account Director

Travelling to meeting

- Station office suite
- High speed train
- Convoy of nuclear-powered trains
- Personalised space
- Smart glazing
  - Blocks out glare
  - Journey time information
- Smart device
  - Best routing to meeting
  - Info lens – wayfinding
  - Called auto pod
The Khoslas family
Family of 4

Tourists on holiday

- Arrive station early
  - Show
  - Shop
  - Play

- Energy generation from footfall

- No gatelines – Authorisation/validation to travel

- Customised carriage interior
Kaito and Hinata Nakamura
Retired

Visiting family

- Integrated journey app
  - Home to destination, all modes
  - Clear instructions wayfinding
  - Visual for hard of hearing

- Smart devices register presence

- Disabled/mobility access
  - Space
  - Step free access
  - Personalised space
  - Induction chair charging
Nuno Tavares, 29
Software Developer

Commuter

- Feeder Train / Moving platform
- High Speed Suburban Maglev
- Passenger profiles / assistance
- Maintenance micro drone
  - Monitors tracks
  - Predictive maintenance
- Delivery drone drops off package
Anna Green, 68
Freight Forwarder

Controlling International Freight Deliveries

- Freight shuttle – high volume medium distance
- Long-distance driverless freight trains
- Maximum cross-border network utilisation
- Sustainable train power
- Sheds wagons on the go
- Cross border gauge adjustment
- Real time train/line monitoring
- Intelligent robots unload cargo
“The best way to predict the future is to invent it”

Alan Kay
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