Big data supporting rail planning and decision making

Case light rail Utrecht

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The potential benefits

- What if analyses
- Monitoring service quality
- Comfort, reliability and robustness
- Crowding and capacity
- Market share

The Netherlands:
Potential cost savings: > €100 million/year

- Utrecht: € 400,000 less yearly operational costs
- The Hague: 5-15% increased ridership
- Amsterdam: ~10% increased cost coverage
- Tram Utrecht: : €200 Million social benefits
Big Data

Challenge the future

App data; tracking travellers
- Access and egress transport services

GSM data; tracking travellers
- Potential public transport services

Vehicle data (AVL); tracking vehicles
- Evaluating and optimizing performance

Passenger data (APC); tracking passengers
- Evaluating and optimizing ridership and passengers flows
The challenge

Data → Information → Knowledge → Improvements
Decision making in public transport

• Most PT projects aim at enhanced reliability
• Service reliability is often missing in CBA and transport models

• We developed:
  • Methodology to incorporate passenger impacts of service reliability:
    • Transport models (reliable forecasts)
    • Cost benefit analyses
• Applied in Utrecht
Case: Uithoflijn (line 12)

Utrecht
- Centrally located in the Netherlands
- 4th largest city
- 300,000 inhabitants
Problem analysis

- Busiest bus line in the Netherlands: 27,000 passengers per day
- Frequency of 23x/hour/direction using double-articulated buses: 30x/hour/direction necessary
- Poor reliability and lack of capacity

- Mobility is still growing
  - +25% planned property in the Uithof: +8,000 students, +10,000 employees
  - Total: 53,000 students, 30,000 employees and 3,500 visitors (hospital)
  - No additional parking space
  - Demand forecast: 46,000 passenger per day
Poor reliability
New tram line (16 /hour)

7,5 km
Operations are planned to start in 2018

12 connected CAF vehicles (2x37,5 m)
Ministry requires CBA

- Regional parties agreed with plans and finances
- €110 million of Minister of Transport available (about 1/3 of total costs)
Our approach

- **Calculations of**
  - Future demand, including rail bonus impacts
  - Costs (infrastructure and operations)
  - Benefits
    - Travel time gains
    - **Reliability gains**

- **Vehicle and passenger data**
  - Decreased waiting and travel times
  - Increased predictability of arrival times
Results CBA

- Total costs: €228 million
- Total benefits: €336 million

- €201 million reliability related

- Cost benefit ratio: 1.2

- Service reliability effects are over >60% of all benefits!

- This method was approved by the Dutch Ministry and the Minister provided the €110 million
Conclusions

- Big Data opportunities in the rail industry
- Vehicle, smartcard, GSM, apps, etc
- Focus, expertise and tooling: data -> knowledge

Example Utrecht
- Little attention to service reliability in cost-benefit analyses
- Translation of vehicle to passenger effects
- Research and case proves:
  - **It is possible to quantify service reliability and calculate the monetary value**
  - **Service reliability benefits made the difference**
- This method was approved by the Dutch Ministry and the Minister provided the required €110 million
Questions / Contact

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Papers:
https://nielsvanoort.weblog.tudelft.nl/

UITP Magazine  International Railway Journal  Emta Report
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