KTH Transport Research

Joel Franklin
Associate Professor of Transport Analysis
Deputy Director, Transport Platform
Sweden's oldest and largest university of technology

- More than 12,000 full-time students
- More than 1,900 PhD Students
- Over 5,100 employees
- Five campuses in the Stockholm region
KTHs strategic cooperation in research

Strategic partnerships:
• **Scania**, Ericsson, ABB, Sandvik, Skanska, Bombardier, Stockholm City, Stockholm County

Research through collaboration:
• 14% of budget from Company collaborations
• 46% external research funding (EU & national funding)

Externally Funded Research Centres

EIT-KICs
• Digital
• Energy
• Raw Materials
• Life Sciences
Current and Future Directions in Transport Research

- Future Transportation Infrastructure
- Innovative Vehicle Concepts
- Transport in the Information Age
- Transport Services
- Policy and Institutional Frameworks
- Safety & Security
- Productivity & Efficiency
- Mobility, Accessibility, User needs
- Environmental quality, climate

Holistic Transport System
Current and Future Directions in Transport Research

I. Transport Planning & Operations Projects

II. Transport Technology Projects

III. Projects on Transport Planning & Operations for New Technology

Sources:

• Integrated Transport Research Laboratory (ITRL)
• Centre for Transport Studies (CTS)
I. Transport Planning & Operations Projects
Example 1: Congestion Charging Trial
January – June 2006
Effects were apparent immediately

<table>
<thead>
<tr>
<th>Last day without charges</th>
<th>First day with charges</th>
<th>First normal working day with charges</th>
</tr>
</thead>
<tbody>
<tr>
<td>KLARASTRANDSLEDEN 16.30 MÅNDAG 2 JANUARI</td>
<td>KLARASTRANDSLEDEN 16.30 TISDAG 3 JANUARI</td>
<td>KLARASTRANDSLEDEN 16.30 MÅNDAG 9 JANUARI</td>
</tr>
</tbody>
</table>

[Images of traffic conditions on different days]
Effects on Traffic Volumes, 2005 vs. 2006
Example 2: 
Bus Bunching

Random variation:
• Waiting passengers
• Traffic flow

Leads to:
• Delayed arrival
• More accumulated passengers
• Further delays

Solution:
• Rather than fixed timetable,
• Use equal headway principle

Successfully implemented in Stockholm
BusMezzo

• Comprehensive dynamic public transport modelling
• Passenger route decisions, reaction to real time information
• Dynamic operations control
• New algorithm for bus regularity
• Field trial Line 1 with SL / KEOLIS:
  – 23% reduced bunching,
  – 10% reduction in passenger waiting times
• Operations expanded to other “blue buses”
II. Transport Technology Projects
**Example 3: Research Concept Vehicle (RCV)**

<table>
<thead>
<tr>
<th>Modular concept: people or goods</th>
</tr>
</thead>
<tbody>
<tr>
<td>Integrated vehicle technology research</td>
</tr>
<tr>
<td>Modular, flexible, all-by-wire</td>
</tr>
<tr>
<td>Rolling test lab</td>
</tr>
<tr>
<td>Prepared for autonomy</td>
</tr>
</tbody>
</table>

- **People involved:**
  - Transport Labs staff
  - 20 Researchers & PhD students
  - 11 MSc & internship
  - 45 students in projects

- **Research and education groups involved:**
  - Machine design & Mechatronics
  - Production engineering & X PRES
  - Vehicle Dynamics
  - Lightweight Structures
  - Electrical Energy Conversion
  - Applied Electrochemistry

- RCV 3.0 workshops ongoing for capturing our future needs
Example 4: Connected Mobility Arena – Automated Bus Traffic
III. Projects on Transport Planning & Operations for New Technology
Example 5: KTH Mobility Pool

Reducing personal car use with an innovative car pool solution
Budget/Funding: 8.2 / 5MSEK STEM
Partners: IKEA, Botkyrka, Hertz, Seamless, Gröna Bilister, Renault

Field test research study
• Service design for maximum user acceptance
• Business model
• Energy efficiency & CO2-reduction
Example 6: Elbilslandet 2.0

Rental EVs & charge infrastructure for tourists on island of Gotland
Period: 2015-2017
Partners: Solkompaniet, KTH, Region Gotland, Nissan, VW, Europcar, Vattenfall
Project budget: 8Mkr, ITRL: 1,8 Mkr (100% EM funding)
Research topics:
• User perspective and behaviour changes to change to EV
• Interview users before, during and after
• Log & analyse usage of rental EVs and chargers
Conclusions

*Trends in transport research:*
- Wired infrastructure and vehicles
- Diffuse mobility providers
- User adaptation processes

*Trends in approaches:*
- Living Labs – adapting the research questions to real-world conditions
- Research demonstrations as a means for public engagement