Nova and CoMET: Improving the management and delivery of mass public transportation in cities

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Presentation Structure

- Introduction: Imperial College London
- Part 1:
  - How Nova and CoMET assist in delivering better metros
  - Benefits of Nova
  - Focus of Nova in 2006
  - Key challenges facing metros
- Part 2:
  - Measuring the contribution of transport to the productivity of cities
Imperial College London and the RTSC

- The RTSC at Imperial College London:
- Three key research themes
  - Urban public transport
  - Benchmarking & performance measurement
  - Urban transport economics & policy
- Activities:
  - Applied research for industry, academic research, teaching
- Key Staff
  - Outgoing Chairman: Professor Tony Ridley
  - Director: Professor Stephen Glaister
  - Managing Associate: Richard Anderson
History of Nova & CoMET metro benchmarking

History of benchmarking at Imperial College London

- 1982 - Hamburg/London productivity comparisons
- 1994 - Group of Five heavy metros formed
- 1996 - Community of Metros (CoMET) founded
- 1998 - Success of CoMET leads to formation of Nova Group for 6 small to medium-sized metros.
- 2004 - Bus Benchmarking group formed (now in 2nd Phase)
- 2005 - Nova reaches 13 members
- 2006 – CoMET continues into its 12th annual cycle, Nova into its 8th

- Huge, growing value to metros with a database of, and information about, 25 metros over 12 years
A diverse range of metros from different cultures stimulates ideas and creativity in the approach to managing a metro

Dublin
Buenos Aires
Taipei

Buenos Aires
Singapore
Newcastle
Naples
Metros share similar problems and challenges and can share solutions

“With no other metros in many countries except the capital city, communication with world metros is very important to provide ideas for improving service quality.

“We try to be best and very often are, but CoMET is very beneficial to us as it opens our eyes to things we might not have seen before”.

Andrew McCusker, Operations Director
NOVA metros use a system of 32 KPIs

**Background**
- B1 Network Size and Passenger Volumes
- B2 Operated Capacity km and Passenger Journeys
- B3 Car km and Network Route km

**Asset Utilisation**
- A1 Capacity km / Route km
- A2 Passenger km / Capacity km
- a3 Passenger journeys / Station
- a4 Proportion of cars used in Peak Hour

**Reliability / Service Quality**
- R1 Revenue operating car km between incidents
- R2 Car hours between incidents
- R3 Car hours / hour train delay
  - r4 Passenger hours delay / passenger Journeys
  - r6 Passenger journeys on time / Total passenger journeys
  - r7 Trains on time / Total trains

**Efficiency**
- E1 Passenger Journeys / Total Staff + Contractor hours
- E2 Revenue Car km / Total Staff + Contractor hours
- e3 Revenue Capacity km / Total Staff + Contractor hours
- e4 Number of Scheduled Trains / Year / Driver

**Financial**
- F1 Total Commercial Revenue / Operating Cost
- F2 Total Cost / Car km
- F3 Service Operations Cost & Staff hours / Car km
- F4 Maintenance Cost & Staff hours / Car km
- F5 Administrative cost & Staff hours / Car km
- F6 Investment cost / Car km
- f7 Total Cost / Passenger Journey
- f8 Operations Cost / Passenger Journey
- f9 Fare Revenue / Passenger Journey
- f10 Average Operating Cost / Station

**Safety**
- S1 Total Fatalities / Total Passenger Journeys
- s2 Suicides / Total Passenger Journeys
- s3 Medical Conditions / Total Passenger Journeys
- s4 Illegal Activity / Total Passenger Journeys
- s5 Accidents / Total Passenger Journeys
Metro KPI reliability indicator: high variations

Car km (thousands) between incidents causing a delay of 5 minutes or more (2004)

Key
- Eu – European
- NA – North American
- SA – South American
- As – Asian
Time series data allows for trends to be identified – who is implementing good practices and what improvement is relatively achievable?

Car km (‘000) between incidents causing delay (5 mins)
Case Studies

Purpose of Case Studies:
- KPI findings can identify major differences between member organisations that justify more detailed examination
- Members establish areas of particular concern and seek other members to share their experience

About Case Studies
- Case Studies - detailed analysis to determine best practices *(3 to 4 per year)*
- Chosen by voting system
- Wide-ranging, practical, emphasis on improving service quality & efficiency
- Final reports serve as a permanent resource for members on best practices and comparative performance
Case Studies – in-depth analysis in most areas of metro management
50 Nova and CoMET Case Studies

- **Operations**
  - Reduction in Station Operating Costs
  - Delay Recovery Strategies
  - Station Management

- **Engineering/Technology**
  - Energy Saving Initiatives
  - Infrastructure Possession Management
  - **Rolling Stock Procurement** *
  - Asset Management
  - Asset Condition Monitoring

- **Passenger Safety**
  - Accident Precursor Monitoring
  - **Safe Movement of Passengers in Stations** *
  - Security *

- **Finance**
  - Increasing ridership through improved accessibility and innovative marketing
  - Fares, Funding and Financing of Metros

- **Management**
  - Capability Upgrade
  - Knowledge Management
  - Business Indicators
  - **Procurement Management** *
  - External Communications Strategies
  - **Human Resources Management** *

- **Customer Service**
  - Service Quality Measurement
  - Customer Satisfaction
  - **Rolling Stock Reliability** *
  - **Passenger Information Systems** *
  - Fares Strategies & Ticketing

*Study undertaken in 2006
Smaller Studies – 90 topics since 2001

Recent Examples

- Information exchange
  - Multi-lingual information
  - Remote Station Supervision and Management
  - Measures to prevent malicious damage
  - Train Radio System Failures
  - Increasing non-fare commercial revenues
  - CCTV System Upgrade
  - Penalties for Graffiti
  - Track Performance in snow
  - Security staff and ticket inspectors
  - Economic life of assets
  - Carriage of Bicycles
Objectives and Scope:
- Identify key risks to passengers
- Provide best practice design guidelines
- Understand balance between safe operation and maintaining station capacity
- Recommend management & technology solutions

Key areas covered:
- Quantification of risks
- Comparison of station and other risks
- Variation in standards and (e.g. Government) policies
- Passenger flow characteristics
- The management of passenger behaviours and culture
- Signage and information
  - Both for normal and emergency situations
Objectives and Scope:
- Identify metros’ standards and specifications
- Identify and compare specifications of recently purchased rolling stock
- Consider options for common standards/benchmarks

Key areas covered:
- Types of specification
- Supplier identification and selection
- Applicable standards for safety, accessibility and reliability
- Comparison of existing technical specifications
- Achieving reliability
- Operation and ownership costs
- Service life and life cycle costs
Improved levels of security may result in:

- Improved passengers’ perception of personal security
- Higher customer satisfaction
- Higher metro usage
- Less damage to assets, resulting in lower costs and improved reliability
- Less disruptions to train services resulting in improved punctuality
- Fewer criminal acts against staff, resulting in a better work environment

Examples of best practices:

- ‘Intelligence based’ security planning
- Improved deployment of staff & variability to security staff planning
- Joined up thinking with Government, Police and local communities
- Improved methods for passengers to report crime
- Playing classical music through public address system
Benefits from Benchmarking – Direct and indirect

- Driver Productivity improvements by Singapore SMRT
  - Reorganisation of drivers’ shifts 10% saved so far

- Station Management rationalisation by Hong Kong MTR
  - 12% reduction in station staff

- Rolling Stock Procurement – North American Metro
  - Justification to move from 2 car-pairs to through gangways, saving several million $, improving capacity by 10%

- Service reliability
  - Impetus for 2 high-performing metros to increase performance even further – beating the best practice benchmark

- Metros’ use with government and stakeholders
  - Montreal – ticketing study used to justify high penalty fares to local media
  - Hong Kong MTR to argue for fare adjustment mechanism
Nova is in its 8th Year. Success is due to its clear purpose

- Benchmarking is NOT merely a comparison of data or a creation of league tables
  - A forum to share experiences and exchange information
  - Stimulates productive “why” questions / identifies lines of inquiry
  - Identifies best practices in operations and management
  - Focus is on implementable results, performance improvement and metro strategy
  - Information to support dialogue with government, regulators and other stakeholders.
Key Challenges Facing Metros
Key Challenges Facing Metros

- Metros are at the centre of city development in large cities
- They confront decision-makers with difficult decisions
- But many metros are not the mature, sustainable businesses they need to be to support the city’s economy
- Some metros assume they are sustainable in quality and finance— but for how long?
- Some metros have formidable problems
- Change is required, stakeholders must be better informed
- A coherent understanding of the issues faced by other metros is necessary
Metro Major Stakeholder Groups: Need to generate consensus and shared understanding on what makes a metro successful for its city

- Media
- Political opposition
- Passengers
- Central Government
- City Government
- Pressure groups
- Local Authorities
- Affected residents
- Regulators
- Business Employers
- Suppliers
- Banks / Financial institutions
- Public institutions (schools, hospitals)
- Other modes (e.g. bus companies providing service to stations)
### Key Challenges Facing Metro Operators

<table>
<thead>
<tr>
<th>Importance</th>
<th>Challenge</th>
<th>Action by</th>
<th>Issues</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Need for funding</td>
<td>Government / Operator</td>
<td>Requires govt to define fares and funding regime; operator to market the system and manage costs</td>
</tr>
<tr>
<td>2</td>
<td>Improving service quality</td>
<td>Operator</td>
<td>Requires operator to be customer-facing. Whole-life asset maintenance <em>and</em> enhancement <em>and</em> replacement</td>
</tr>
<tr>
<td></td>
<td>Asset management</td>
<td>Operator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Business growth/survival</td>
<td>Operator</td>
<td>Responding to strategic opportunities and threats</td>
</tr>
<tr>
<td>3</td>
<td>Managing external pressures</td>
<td>Operator</td>
<td>Managing the metro stakeholders. Flexibility as circumstances change. Level modal playing field/ integration</td>
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<tr>
<td></td>
<td>Internal Management</td>
<td>Operator</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Competition</td>
<td>Government</td>
<td></td>
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<tr>
<td></td>
<td>Over-crowding</td>
<td>Government / Operator</td>
<td>Pricing, operational management, capacity expansion</td>
</tr>
<tr>
<td>4</td>
<td>Safety and security</td>
<td>Operator</td>
<td>Personal security, terrorism threat</td>
</tr>
<tr>
<td></td>
<td>Equality and inclusion</td>
<td>Government</td>
<td>Access for the frail and disabled</td>
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Towards a more sustainable metro

- There are beacons of success in the metro world, but much can be done better. Practical change is achievable.

- Requirements to develop a sustainable metro business:
  - Active engagement of government with operator for issues that affect the operator.
  - Government focus on creating a sustainable operating business, with the operator having substantial management autonomy.
  - Metros must be outward looking, customer facing, and educating stakeholders.
  - Metro finances must be better understood and a longer term framework established—sustainable fares policy is central. Long-term asset management and investment is then possible.
Measuring the contribution of transport to the productivity of cities

Summary of research for the UK Department for Transport
Author of research: Dr. Daniel Graham, Imperial College London
Key questions about the contribution of metros to the economy

- Efficient and reliable transport is essential for the effective functioning of cities

- Cities provide the necessary environment for the development and growth of the most productive economic activities (in terms of GDP – e.g. the finance sector)

- This gives rise to key questions facing the UK Government:

  “Are there benefits to the economy from transport investment that are not included in current appraisal calculations?”

  In particular, “to what extent does good urban transport give rise to increased economic productivity?”
Example: Why this is important in London?

- **CrossRail:** a £10Bn ($17 US) new rail scheme, crossing London in 12 minutes
- **Huge economic benefits to the financial districts of London**
  - Industry believes that good public transport accessibility to the city is essential to ensure London is competitive with Frankfurt, New York, etc.
Key questions about the contribution of metros to the economy

- UK appraisals for major transport investments are based on Cost Benefit Analysis.
  - Economic Benefits include: fare revenues, travel time savings to commuters, leisure travellers, businesses and externalities that can be quantified (e.g. road congestion relief)
  - Economic Costs include capital costs, operating costs, etc.

- Improved urban transport provides additional economic benefits that are not currently quantified.
  - i.e. the positive benefits of mass urban transport (such as metros) to the economy are greater than previous assumed
  - E.g. agglomeration benefits – bringing activities and industry closer together – benefits over and above travel time savings

- A statistical model was developed to determine a robust method of measuring the economic benefits of transport in cities.
Results – how productivity changes as urban accessibility improves

- There is a positive and significant impact from urban accessibility for most sectors of the economy.
- The magnitude varies substantially across industries.
- If urban accessibility doubles:
  - 20% increase in service sector productivity
  - 25% increase in financial sector productivity
  - 8% increase in manufacturing sector productivity
Application of urban accessibility elasticities in transport appraisal

- UK DfT have reappraised a proposed rail scheme (CrossRail) using the results.
- Consideration of the urban economic effects, the so-called “Agglomeration Benefits” increase total benefits of the project by 25%.

<table>
<thead>
<tr>
<th>Benefits</th>
<th>Welfare (£ million)</th>
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<tbody>
<tr>
<td>Business time savings</td>
<td>4,847</td>
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<tr>
<td>Commuting time savings</td>
<td>4,152</td>
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<tr>
<td>Leisure time savings</td>
<td>3,833</td>
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<tr>
<td><strong>Total user benefits (conventional)</strong></td>
<td><strong>12,832</strong></td>
</tr>
<tr>
<td>Agglomeration benefits</td>
<td>3,094</td>
</tr>
<tr>
<td><strong>Total benefits (new approach)</strong></td>
<td><strong>15,926</strong></td>
</tr>
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Conclusions - Urban Transport Investment and Economic Productivity

- There appears to be a strong link between higher productivity and the accessibility or density of activity available to firms
  - Particularly for the financial / services sector
- The economic case for infrastructure investment can be informed by an understanding the productivity – agglomeration relationships.
- Investment in transport infrastructure:
  - supports the efficiency of cities,
  - influences the level of urban accessibility, and
  - therefore it can have an important effect on productivity.
- Transport investment can help to foster the conditions for cities to be economically efficient environments
Further Information

- Dr. Dan Graham:  d.j.graham@imperial.ac.uk
- Published reports can be found at:  http://www.dft.gov.uk
  - “Transport, wider economic benefits and impacts on GDP”
  - “Wider economic benefits of transport improvements: link between agglomeration and productivity”
Thank You
Extra Slides