Benchmarking Bus Operations

Presentation to the National Capital Region Transportation Planning Board

27th January 2011
Definition of Benchmarking

- A systematic process of continuously measuring, comparing and understanding organisations’ performance and change in performance
  - of a diversity of key business processes
  - against comparable peers anywhere else in the world
  - to gain information which will help the participating organisations to improve their performance

- Adapted from the definition by Lema and Price
Sixteen year history of benchmarking projects facilitated by

1994  Group of Five heavy metros formed (incl. NYCT)

1996  Community of Metros (CoMET) founded (9 of the world’s largest 12 metros)

1998  Success of CoMET leads to formation of Nova group for medium-sized metros

2004  International Bus Benchmarking Group established

2010  Suburban Rail Benchmarking Group established

Significant benefits have driven continued participation: for example NYCT New York is a member for CoMET for 16 years and the IBBG for 6 years
Imperial College currently ranks 9th in the world

- Rankings released in September 2010 shows Imperial College ranked 9th between Berkeley and Yale.
Thirteen Bus Benchmarking Group members

- Vancouver
- Montreal
- New York
- London
- Brussels
- Paris
- Milan
- Lisbon
- Barcelona
- Singapore
- Los Angeles
- Sydney
- IBBG Member
IBBG Member Size: Passenger Boardings – Trends
Possible to Compare Organisations of Different Sizes

How did London achieve this growth:

- Improved quality through Quality Incentive Contracts
- A simplified (and competitive) fare structure
- Introduction of congestion charging
- Increased network coverage
- Growth in the local economy
Member size - Fleet

Number of Vehicles in Fleet 2001-2009

Number of Vehicles

International Bus Benchmarking
Background Information example: Supply profile differences help to understand differences in performance

Use of Vehicles in Revenue Service (Average Weekday) - 2008

% of total fleet

0% 10% 20% 30% 40% 50% 60% 70% 80% 90% 100%

1 2 3 4 5 6 7 8 9 10 11 12 13 14 15 16 17 18 19 20 21 22 23 24

Hour

International Bus Benchmarking
### High Level Benefits of Membership

<table>
<thead>
<tr>
<th>Benefits mentioned by current International Bus benchmarking Members</th>
</tr>
</thead>
<tbody>
<tr>
<td>- Save resources by learning where and how to be more productive</td>
</tr>
<tr>
<td>- Save resources by taking into account other members’ experiences - no need to ‘reinvent the wheel’</td>
</tr>
<tr>
<td>- Improved allocation and prioritisation of resources by understanding where most improvements can be achieved</td>
</tr>
<tr>
<td>- Save resources on research / consultants</td>
</tr>
<tr>
<td>- Defending &amp; promoting your position to government, authority, media, etc</td>
</tr>
<tr>
<td>- Expert network with quick information exchange</td>
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<tr>
<td>- Better informed and more creative staff</td>
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</tbody>
</table>
Objectives of Bus Benchmarking Group

There is rarely a challenge that another member has not also faced

- The group acts as an independent, confidential and effective forum for information exchange
  - Expert level
  - Fast access to information / exchange of information

- It builds a system of objective measures to identify best practice
  - Who are best?
  - Can we learn from them?
  - Who has improved and how?
  - Where are our strengths and weaknesses?
  - How much can we improve?

- Building networks of contacts - multidisciplinary
Groups owned, run by the participating agencies; group presidencies rotate annually

Key attributes are:

- Independence
- Speed
- Confidentiality
- Contacts/networking

Project management and analysis carried out by Imperial College London

Ideal group size between 10 - 15 organisations
Confidentiality Agreement

- A ‘closed group’ leads to honest and open information sharing - It is KEY to successful benchmarking

- Complete openness within the benchmarking groups, complete confidentiality to the outside

- Information may be disseminated as widely as participants wish within their own organisations

- Use only anonymised and randomised data in information issued to outside organisations or individuals, including shareholders, government or the media, or published in academic papers

- A significant leak by any participant may lead to the exclusion of that participant from the benchmarking group
Elements of the Benchmarking Process
Annual cycle – Members decide

- Standardised Key Performance Indicator (KPI) System to compare performance and identify best practices + Graphing & Dashboard Tools
- Member Profile (context) report for improved understanding of performance
- Case Studies, in-depth research on areas of common interest
- Expert workshops
- A mechanism for quick collection of other specific data and information
  - Clearinghouse Studies (member initiated)
  - Online Forum
- Secure website: [www.busbenchmarking.org](http://www.busbenchmarking.org)
- Two meetings per annum:
  - Steering Group (mid-year) and Annual
Studies: KPIs can identify major differences between organisations, justifying more detailed examination

- **About Detailed Case Studies** (15 already completed studies)
  - Proposed by members and voted for at the Steering Group Meeting
  - Detailed analysis by RTSC to determine best practices
  - 2-3 Studies per year per group. Lead time – 6 to 9 months
  - Wide-ranging, practical, emphasis on improving service quality & efficiency

- **Clearinghouse study**: Member initiated exchange of information on a specific topic (28 already completed)
  - Lead-time 1-2 months
  - Member performs the analysis, RTSC facilitates
  - Used to inform strategy, business case and option development….To identify best practices

- **Forum question**: Member post a short specific question on the website
  - Lead-time 2 weeks, More than 125 questions posted in 6 years
Bus member experts have initiated studies on a large variety of topics. Six years of reports and deliverables available. Examples are:

- **Case Studies**
  - Driver Productivity
  - Service Control
  - Vehicle Maintenance
  - Bus Priority
  - Service Quality Measurement
  - Safety Programmes
  - Real-time information

- **Clearinghouse studies**
  - Eco Driving
  - Passenger Counting
  - Accident Management
  - Control Room Organisation
  - Hybrid Buses
  - Driver Complaints

- **Forum**
  - Tyre Pressure Monitoring
  - Cleanliness of Buses
  - Driver Reward
  - Employee Time Lost due to Accidents
  - All Door Boarding
  - Contactless Fare Cards

- **Workshops**
  - Service control and route management
  - Impacts of new EU bus regulation
  - AVL data for service control
  - Bus Priority
  - Vehicle Maintenance
Welcome to the International Bus Benchmarking Group website

The Bus Benchmarking Group is a programme of international benchmarking of bus operations and public transport. It is made up of a consortium of thirteen bus organisations: TMB (Barcelona), STIB/MIVB (Brussels), Dublin Bus, Carris (Lisbon), London Buses, LAOMTA (Los Angeles), ATMT (Milan), NYCT (New York), STM (Montréal), RATP (Paris), Singapore SMRT, Sydney Buses and the Coast Mountain Bus Company (Vancouver).

Click here to see the International Bus Benchmarking Group Information video

The objectives of the International Bus Benchmarking Group are to:

- Establish a system of measures for internal management
- Use the system of measures to identify best practice
- Support decision making within the organisations
- Provide comparative information for senior management and stakeholders.

All the group’s activities are determined by the member bus organisations. A senior manager from one of the members is elected annually as president and a work programme is developed to accomplish the group’s objectives.

The Group is jointly owned and driven by the members with project management and administration carried out by the RTSC at Imperial College London on their behalf. Imperial also provides many of the research resources for the group.

All International Bus Benchmarking Group activities are carried out within a framework of confidentiality. Any information that is released is generally anonymised. No confidential information is allowed to be released to third parties without the expressed permission of the members. All member bus organisations are required to sign and adhere to a confidentiality agreement.
<table>
<thead>
<tr>
<th>Topics</th>
<th>Replies</th>
<th>Author</th>
<th>Last Post</th>
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<td>Overtime as a Percent of Standard Pay</td>
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<td>Mr. Luigi Vala</td>
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<td>Campaign Member Get Member/Employee Get Member</td>
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<td>Judith Revieja</td>
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<td>Passenger Pass-up metrics</td>
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<tr>
<td>Recording fuel issued and distance travelled by buses</td>
<td>9</td>
<td>Karen James</td>
<td>2010-12-14</td>
</tr>
</tbody>
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International Bus Benchmarking
Benefits: understanding productivity improvements

Using benchmarking results to understand where productivity improvements can / must be made, some examples:

- Understanding service control productivity differences
  - 33 Buses per controller versus 170 buses
  - Case study showed that some members could improve productivity
  - Member now investigating how to improve with visits to other members

- A member recognised that their administration cost is too high
  - Cost reduction efforts can be focussed on areas where most improvement can be made

- A member discovered that their % of fleet used in peak was too low and that they run too many deadhead km.
  - Benchmarking results lead to prioritisation of resources
Benefits: Using benchmarking results in communication with stakeholders (Government, Authority, Media, Passengers)

Using benchmarking results in communication with stakeholders:

- A member used the benchmarking to proof that public funding was spend effectively and efficiently
  - Resulted in $130 million additional funding

- An operator was asked by the Mayor to show ‘value for money’: benchmarking data was readily available
  - Operator called the IBBG dataset ‘invaluable’, savings est. $150k

- A member showed unions that driver absenteeism is 200% higher than the Group average
  - Provided the member with a much better position in their negotiations

- Members use data to ‘back-up’ requests for additional funding
  - Imperial presented to a Minister of Transport the business case for additional funding for new buses
Benefits: Informed and more effective decision making

- Much return on (benchmarking) investment is created by NOT making unnecessary costs and investments

Example of focus on fuel efficiency:
- Smaller cooling fans could be installed that run on the battery, rather than on the engine.
  - Small investments led to significant (10-15%) fuel savings
- Lessons shared in reducing idling, Operator saved $150,000
- ECO driving experiences shared, 6% fuel efficiency

- Members use the data from the Benchmarking Group to set realistic targets

- Knife attack on driver led to study of driver cabins and in-vehicle CCTV
  - Information from other members gave different options for drivers cabin designs and CCTV configurations.
International Bus Benchmarking Group

Key Performance Indicators

(KPIs)
Balanced Scorecard approach

Six Success Dimensions:

- Customer
- Internal Processes
- Growth & Learning
- Environment
- Safety & Security
- Financial
## Bus Benchmarking Group KPIs

### Growth & Learning
- **G1** Passenger Boardings
- **G2** Vehicle Kilometres
- **G3** Staff Training (categories)

### Safety & Security
- **S1** Number of vehicle accidents per vehicle km & hour
- **S2** Number of staff accidents per million staff hours
- **S3** Number of passenger accidents per boarding
- **S4** Number of 3rd party accidents
- **S5** Incidences of on-board crime

### Customer
- **C1** Passenger km / Revenue capacity km
- **C2** Actual / Scheduled revenue km & hour
- **C3** dynamic customer information
- **C4** low floor buses
- **C5** % buses on-time (Punctuality)
- **C6** Regularity (Excess Wait Time)
- **C7** Customer satisfaction

### Financial
- **F1** Total cost per total vehicle km & hour
- **F2** Total operating cost per total vehicle km & hour
  - (F3 service operation, F4 maintenance, F5 administration)
- **F6** Service operation cost per revenue vehicle km & hour
- **F7** Total fare revenue / Total operating cost
- **F8** Total operating cost per passenger boarding/kilometre
- **F9** Fare revenue per passenger boarding/kilometre

### Internal Processes
- **P1** % of fleet used in peak
  - (not used split by cause)
- **P2** revenue / total vehicle km & hour
- **P3** Total vehicle hours per labour hour
- **P4** staff absenteeism rate (categories)
- **P5** Mean distance between failures
- **P6** lost vehicle km (internal/external causes)

### Environmental
- **E1** Diesel/CNG fuel consumption per 100 total vehicle km
- **E2** Diesel/CNG fuel consumption per passenger kilometre
- **E3** Diesel/CNG fuel consumption per total vehicle tonne km
- **E4** % of fleet meeting EURO emissions categories
- **E5** CO2 emissions per passenger km & vehicle km
Purpose and use of KPIs

- Benchmarking is NOT merely a comparison of data or a creation of league tables.

- The structured KPI comparisons can be used for:
  - Stimulating productive “why” questions / identifying lines of inquiry.
  - Identifying high priority problems, strengths and weaknesses.
  - Identifying trends: performance can be monitored over time, allowing the identification of organisations which have truly improved performance over time.
  - Internal motivation – setting targets for improved performance.
  - Supporting dialogue with government, authorities, media and other stakeholders (confidentiality permitting).
KPI example: Staff absenteeism - Bus organisation ‘A’ now realised absenteeism is too high relatively to peers, info used with talks to unions

Staff Absenteeism Rate
Index: 1 = 2008 group average

- Performance pay
- Outsourcing
- Reduced union activity
- Mutual respect

International Bus Benchmarking
Financial Comparison and Trends – Costs normalised using World Bank Purchasing Power Parity (PPP) system

Total operating cost per total vehicle km 1999 - 2008
Index: 1 = Total cost group average in 2008

Generally increasing trend:
Wages (60% of cost) grow faster than inflation

International Bus Benchmarking
**KPI Graphing Tool – Excel based software that allows members to make any indicator with the available data**

**Benchmarks**

**Graphing Tool - KPI Graph Generating Tool**

Version February 2010  Developed by Xiaw Li (RTSC, Imperial College London)

Important: If you use the graphs generated by this tool, Always 'Copy - Paste Special as picture', the graphs into your document. This is necessary to keep the incorporated KPI data in the graph confidential.

### Maintenance costs (m)

<table>
<thead>
<tr>
<th>Input Indicator</th>
<th>Code</th>
<th>Financial Conversion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Maintenance costs (m)</td>
<td>MC</td>
<td>No Financial Conversion</td>
</tr>
</tbody>
</table>

<table>
<thead>
<tr>
<th>Input Denominator (Leave blank if raw data required)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Passenger boardings (m)</td>
</tr>
</tbody>
</table>

### Graph Name:

Maintenance costs (m) per Passenger boardings (m)

### Quick options

- **Anonymous All Buses**
- **Name All Buses**
- **Select All Years**

### Graph Output Options

- Absolute Value
- Indexed Value - Anonymized

### Ranked graph options

- Ascending Order
- Descending Order

### Draw graph button

International Bus Benchmarking
Closing statements
Key Success Factors of the International Bus Benchmarking Methodology

- **Confidentiality**
- **Speed**: Quick information exchange
- **Independence**: Members own the groups and steer research
- Academic Institution: Members have confidence and trust in the management of the group and objectivity of the analysis
- Manageable group size: 10-15 members
- Long-term approach, annual cycles
- Continuous development: comparability takes time
- Board level commitment
- High level performance (KPIs) understood by drill-down in detailed studies
- Quick wins: Clearinghouse studies and Web forum
- There is significant variability in comparable areas of performance

- **There is rarely a challenge that another member has not also faced**
United States (International) Public Transport Benchmarking Activity

- **CoMET (large metros):**
  - New York City Transit

- **Nova (medium sized metros):**
  - Chicago CTA

- **International Bus Benchmarking Group:**
  - MTA New York City Transit
  - MTA Bus
  - Los Angeles County Metropolitan Transportation Authority

- **International Suburban Rail Benchmarking Group:**
  - MTA Metro North
  - MTA Long Island Railroad
  - BART – San Francisco

- Development: **Mid-sized North American Bus Benchmarking Group**
  - 150-600 buses
  - Rochester, Forth Worth, Eugene, Syracuse, Milwaukee, Dayton
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Thirteen members as of December 2009:

- Transport Metropolitans de Barcelona (TMB, Barcelona) Bc
- Société des Transports Intercommunaux de Bruxelles (STIB, Brussels) Bs
- Dublin Bus (Dublin) Db
- Los Angeles County Metropolitan Transport Authority (LACMTA) LA
- Companhia Carris de Ferro de Lisboa (Lisbon) Lb
- London Buses (LBSL, London) Ln
- Azienda Trasporti Milanesi (ATM, Milan) Mi
- Societe de Transport de Montréal (STM, Montréal) Mt
- MTA – New York City Transit (NYCT, New York) NY
- Régie Autonome des Transports Parisiens (RATP, Paris) Pa
- SMRT Buses (Singapore) Sg
- State Transit Authority of New South Wales (STA, Sydney) Sy
- Coast Mountain Bus Company, (CMBC, Vancouver) Vc

Presidency rotates annually – currently held by STIB Brussels