Technical considerations on rapid transit mode selection

BRT / LRT potentialities in France

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Certu’s mission

- Capitalizing knowledge
- Disseminating knowledge and methodologies

- Statistics, observation
- Information letters
- Articles in the specialized press
- Web site
- Technical expertise
- Training sessions, conferences
- Standardization
- Publications

- Studies
- Experimentation and innovation

Certu’s mission focuses on capitalizing and disseminating knowledge and methodologies through various means such as statistics, observation, information letters, articles in specialized press, web site, technical expertise, training sessions, conferences, standardization, and publications. This mission involves studies and experimentation and innovation.
Contents

1. Influences of urban characteristics in any mobility system,
2. About the quality of service, the key issue to enhance a PT network
3. Some figures on PT networks performances in France
4. Conclusion / challenges for a better implementation process
Three sets of urban characteristics that can be classified by growing order

- **Geographical characteristics**, such as rivers, hills that can be unfavourable for cycling or walking, the climate…

- **Socio- economical characteristics**, such as ageing distribution, tourist activities, income distribution (linked to the motorisation rate), the socio-professional distribution

- And 5 fundamental urban configuration characteristics :
  - The urban size
  - The urban space polarization
  - The density
  - The spatial distribution of the mobility generators
  - The configuration and rate of mobility and parking space

Ref: Thesis of Ph Emangard, business and financial efficiency of urban PT - 1991
To conclude shortly this topic:

The congestion or the car space-time overcost are the main advocate of public transport.

The PT system selection can be only specific; it is necessary to have a «network» approach regarding all modes.

Faced with this urban configuration diversity, setting up selection rules is risky, and these new modes BRT are welcome.
The quality of service:
the fundamental key issue for improving any modal transfer

- regularity, on time performances, the same run time whatever the hour, connecting services,

- All kind of comfort and information needs before / during the trips (noise, cleanliness, pollution, accessibility, passengers /m², seats, safety, security etc…)

- reliability and alternatives in case of service disruption or disturbances

- other services in interchanges…

European standard – June 2002: “EN 13816”
It defines quality measures method and management for PT
The virtuous quality circle
or
The willingness to pay circle

Performance of quality management

Increased financial Capacity to improve Service quality

Better service quality

Higher attractiveness of the services

Higher willingness to pay

New customers

Higher fares

High services quality

Higher revenues

Lost Customers

Higher willingness to pay
<table>
<thead>
<tr>
<th>Rate Receipt / Operating cost</th>
<th>Low</th>
<th>High</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>&lt; 200</td>
<td>200 - 300</td>
</tr>
<tr>
<td>Athens</td>
<td>Rotterdam</td>
<td>300 - 400</td>
</tr>
<tr>
<td>The Hague</td>
<td>Amsterdam</td>
<td>over 400</td>
</tr>
<tr>
<td>Brussels</td>
<td>Mexico</td>
<td></td>
</tr>
<tr>
<td>Antwerp</td>
<td>Turin</td>
<td></td>
</tr>
<tr>
<td>Bonn ; Oslo</td>
<td>Helsinki</td>
<td></td>
</tr>
<tr>
<td>Lyon</td>
<td>Hamburg</td>
<td></td>
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<tr>
<td>Copenhagen</td>
<td>New York</td>
<td></td>
</tr>
<tr>
<td>Dublin</td>
<td>Lisbon</td>
<td></td>
</tr>
<tr>
<td>Bern</td>
<td>London</td>
<td></td>
</tr>
</tbody>
</table>

Operating cost efficiency and PT using rate (ref: European project Quattro)
Outside Paris, the main French Metros were built in the 70ties.

Now, 111 km and almost no more project.
French tramway re-birth, since the 80th

Still a lot of tramway routes in project or in construction (14 green)

All these projects are not only a transport tool but also an urban enhancement tool,

Expensive investment cost from 20 to 30 M€ / KM - 30% to 40% of urban enhancement.

The smallest “tram cities” are Orléans (270 000), Brest (220000) and Reims (210000),

The first Tram-train projects are appearing, such as in Paris, Lyon and Mulhouse.
Nantes, evolution of tram implementing process, more transparent, more flexible
Grenoble, the first tram line in the main pedestrian street (in off peak hour !)

Max 25 km/h , and could be 10 to 15 km/h

Down town
Montpellier, the tramway leaving the main central pedestrian square – Down town
French BRT trend: a Bus implemented like a Tram

Urban tramway projects tend to be too expensive below 50,000 trips/day.

Two bi-modal technologies appear, one with a rail, the other with a camera, which was implemented with success in Rouen.

A lot of projects, not necessarily guided, but often implemented as a tram, such as in Nantes, branded “Busway” as the fourth tram line (7 M€ / km).
Nantes – the busway with articulated buses, implemented like the other tram lines, that will be opened the 6th of November – 7 M€ / km
Rouen: TEOR is guided only at stations, that are looking like a tramway station
Rouen: the alternative one-way axial bus lane in a narrow street

in order the bus to be always the first at the junction
<table>
<thead>
<tr>
<th>City</th>
<th>Business speed (km/h)</th>
</tr>
</thead>
<tbody>
<tr>
<td>TOULOUSE</td>
<td>33</td>
</tr>
<tr>
<td>RENNES</td>
<td>33</td>
</tr>
<tr>
<td>MARSEILLE</td>
<td>32</td>
</tr>
<tr>
<td>LILLE</td>
<td>32</td>
</tr>
<tr>
<td>LYON</td>
<td>26</td>
</tr>
<tr>
<td>ORLEANS</td>
<td>22</td>
</tr>
<tr>
<td>MONTPELLIER</td>
<td>20</td>
</tr>
<tr>
<td>NANTES</td>
<td>20</td>
</tr>
<tr>
<td>ROUEN</td>
<td>20</td>
</tr>
<tr>
<td>STRASBOURG</td>
<td>19</td>
</tr>
<tr>
<td>LILLE</td>
<td>18</td>
</tr>
<tr>
<td>GRENOBLE</td>
<td>17</td>
</tr>
<tr>
<td>SAINT-ETIENNE</td>
<td>16</td>
</tr>
<tr>
<td>LYON</td>
<td>16</td>
</tr>
<tr>
<td>MARSEILLE</td>
<td>15</td>
</tr>
</tbody>
</table>

A much better speed with the metro, due to his exclusive route.

A limited speed with our urban tramway.

Our “BRT” projects will follow the same insertion objectives.

Some Tram-train projects appear with a much higher speed and spacing (Lyon, spacing 1km, and then a higher speed 38 km/h).
A good urban tramway seems to be between 50,000 et 90,000 trips per day.

Montpellier is now the most attractive: over 120,000 trips/day and almost congested.

Lyon’s tram line are now much better: between 55,000 et 60,000 trips per day.

Our biggest BRT, the Trans Val de Marne (île de France), carried 23,000 in 1993 and now 45,000 trips/day, with articulated buses – at maximum capacity.
Lyon, has the best offer in all modes, the best use (240 trips/Inhabitant/year), but the heaviest charges.

Dijon is expensive, but the best network with only buses (142 trips/Inh/year), and also much more attractive than Lille and Toulouse (around 100 trips/Inh/year)

Lille and Toulouse should enhance its secondary network, as its use stay low…
<table>
<thead>
<tr>
<th></th>
<th>1992</th>
<th>2001</th>
</tr>
</thead>
<tbody>
<tr>
<td>Number of trips</td>
<td>1 250 000</td>
<td>1 550 000</td>
</tr>
<tr>
<td></td>
<td></td>
<td>+ 24 %</td>
</tr>
<tr>
<td>Preservation of PT market</td>
<td>14 %</td>
<td>14 %</td>
</tr>
<tr>
<td>Continuation of the cycling decrease</td>
<td>5 %</td>
<td>3 %</td>
</tr>
<tr>
<td>Walking increase</td>
<td>27 %</td>
<td>30 %</td>
</tr>
<tr>
<td>Small car decrease</td>
<td>54 %</td>
<td>53 %</td>
</tr>
</tbody>
</table>

Comparison between two household surveys in the urban area of Grenoble
Rouen : marginal operating cost comparison between the different modes

<table>
<thead>
<tr>
<th>Year 2003</th>
<th>Conventional buses 40 routes</th>
<th>TEOR (Guided buses) 35 000 Trips/day</th>
<th>Tramway 60 000 Trips/day</th>
</tr>
</thead>
<tbody>
<tr>
<td>Cost Vehicle X Km</td>
<td>3,88</td>
<td>4,88</td>
<td>5,90</td>
</tr>
<tr>
<td>Trips / Km</td>
<td>1,81</td>
<td>4,41</td>
<td>10,66</td>
</tr>
<tr>
<td>Cost of the trip</td>
<td>2,14</td>
<td>1,11</td>
<td>0,55</td>
</tr>
<tr>
<td>Cost coverage by fares</td>
<td>19,02%</td>
<td>36,84%</td>
<td>73,66%</td>
</tr>
</tbody>
</table>

Receipt per trip : 0.41 Euro

With a driver cost of around 2,9 € / km, i.e. : 75% for the bus, 60% for TEOR, 50 % for the tram
Some conclusions

- We need to highlight more the advantages of a strong local governance.

- These two technologies, BRT and LRT have intrinsically different technical potentialities, particularly in term of capacity within the same space.

- Over ground projects with high capacity tend to create strong and large cuts inside urban sectors, that could have a bad impact in cities with high touristic potentialities.

- Following our tram re-birth, the same success is expected with our BRT concept.
Challenges for a better implementation process

• To improve more the clean modes, and particularly cycling as we still use this mode too little, less than 4% (10 to 12% in Germany in average ! ).

• To continue the capitalisation and evaluation of efficient running ways implementation and regulation measures for tram and buses… The infrastructure is their fundamental sub-system.
Thank you for your attention

François Rambaud – CERTU – France

Certu publication : Urban transit modes Guidance for a system global approach)
Certu publication : BHNS – Concept and recommendations)
Certu publication : The urban mobility in France, the 90ties