Non-economic benefits of standards: Case study of the Shenzhen Transport Commission

Shenzhen Institute of Standards and Technology (China)
Summary

• Background and objectives of the project
• Four steps to conduct the assessment
• Conclusions of the project
Background

Objective

• Assess the non-economic benefits of **Intelligent Public Transportation Dispatch System Standards** used by the Shenzhen Transport Commission

Approach

• ISO methodology

Duration

• June to October 2013
Four steps in the assessment

1. Understand the value chain
   - Clarify the functions of the Shenzhen Transport Commission
   - Understand its value chain and determine the preliminary scope for the study
   - Select the intelligent public transportation dispatch system as a sample for the assessment
   - Analyze the core process of the system

2. Identify the impacts of standards
   - Analyze the key value drivers
   - Identify the standards used in the intelligent public transportation dispatch system
   - Finalize the scope of the study

3. Select key operational indicators
   - Select key operational indicators to measure the impacts of standards

4. Measure the impacts of standards
   - Determine qualitative and quantitative impacts of standards
   - Calculate and summarize the non-economic benefits
Step 1: Analyze the value chain (1)

Value chain of the Intelligent Public Transportation Dispatch industry

<table>
<thead>
<tr>
<th>equipment providers</th>
<th>production</th>
<th>procurement</th>
<th>construction</th>
<th>operation</th>
<th>monitoring</th>
<th>maintenance of equipment</th>
</tr>
</thead>
<tbody>
<tr>
<td>system providers</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>bus companies</td>
<td></td>
<td></td>
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<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>traffic management</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>departments</td>
<td></td>
<td></td>
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<td></td>
<td></td>
</tr>
</tbody>
</table>
Step 1: Analyze the value chain (2)

Core process of the Intelligent Public Transportation Dispatch

- passenger flow analysis
- planning scheduling
- real-time scheduling
- statistical analysis
- operational security

- personnel
- vehicles
- stations
- line
Step 2: Identify the impacts of standards (1)

- Key aspects of the operation and areas of impacts of the standards

<table>
<thead>
<tr>
<th>Key operations</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operations management</td>
<td>The includes real-time operation dispatching, monitoring management, safety management, station management and emergency control.</td>
</tr>
<tr>
<td>Consumer</td>
<td>One of the targets of Intelligent Public Transportation Dispatch system is to facilitate public travel and ensure citizens have a comfortable and satisfying traffic environment.</td>
</tr>
</tbody>
</table>
### Main standards used

<table>
<thead>
<tr>
<th>No.</th>
<th>Business functions</th>
<th>Activities</th>
<th>Standards No.</th>
<th>Titles of Standards</th>
</tr>
</thead>
</table>
| 1   | Intelligent Public Transportation Dispatch System | Traffic statistics analysis        | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 2   | Planning & scheduling       | Planning & scheduling                | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 3   | Real-time scheduling       | Real-time scheduling                 | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 4   | Operational monitoring     | Operational monitoring               | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 5   | Emergency               | Emergency                            | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 6   | Query statistics     | Query statistics                      | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 7   | Operational decision     | Operational decision                 | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 8   | Ticket settlement       | Ticket settlement                     | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 9   | Operational security     | Operational security                 | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
| 10  | User rights           | User rights                          | SZDBZ 30-2010  
SZDBZ 35-2011  
SZDBZ 36-2011 | "Intelligent Public Transportation Dispatch System-Vehicle Dispatch Terminal"  
"Intelligent Public Transportation Dispatch System-Platform Specification"  
"Intelligent Public Transportation Dispatch System-Communication Protocol" |
### Step 3: Selection of key operational indicators

<table>
<thead>
<tr>
<th>No.</th>
<th>Operational indicators</th>
<th>Definition of the indicators (before &amp; after the introduction of standards)</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dispatch mode</td>
<td>Degree of automation of the dispatching process</td>
</tr>
<tr>
<td>2</td>
<td>Operation Management</td>
<td>Degree of real-time monitoring of the operations management vs. ad hoc monitoring</td>
</tr>
<tr>
<td>3</td>
<td>Safety monitoring</td>
<td>Degree of safety monitoring of the bus operations remotely through the dispatch platform</td>
</tr>
<tr>
<td>4</td>
<td>Operational guarantee</td>
<td>Degree of reliability through operational personnel, vehicles, stations and lines established</td>
</tr>
<tr>
<td>5</td>
<td>Operation Condition</td>
<td>Degree of monitoring and control of the operational condition of the buses</td>
</tr>
<tr>
<td>6</td>
<td>Regulatory Indicators</td>
<td>Degree of harmonization of the indicators applied by the bus company in data collection assisting the management of the Transport Commission of Shenzhen Municipality</td>
</tr>
<tr>
<td>7</td>
<td>Emergency Coordination</td>
<td>Response time and effectiveness of taking emergency measures and coordination of such measures</td>
</tr>
<tr>
<td>8</td>
<td>Subsidy support</td>
<td>Provision of solid criteria and transparency in the payments for staff</td>
</tr>
<tr>
<td>9</td>
<td>Decision support</td>
<td>Precision of data to support decision-making through a database supporting the decision-making of the Transport Commission of Shenzhen Municipality</td>
</tr>
<tr>
<td>10</td>
<td>Quality of service</td>
<td>Service quality, measured as average waiting time of passengers, rate of complaints and overall convenience of passengers to use the bus services</td>
</tr>
</tbody>
</table>
## Step 4: Measure the impacts of standards

### Qualitative analysis of the impact of standards

<table>
<thead>
<tr>
<th>No.</th>
<th>Operational indicators</th>
<th>Impacts of standards</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Dispatch mode</td>
<td>Higher efficiency and degree of automation of the dispatch of the buses</td>
</tr>
<tr>
<td>2</td>
<td>Operation Management</td>
<td>Management staff can control operations in real-time</td>
</tr>
<tr>
<td>3</td>
<td>Safety monitoring</td>
<td>Management can monitor operations remotely</td>
</tr>
<tr>
<td>4</td>
<td>Operational guarantee</td>
<td>Management can guarantee reliable operations of personnel, vehicles, stations and lines</td>
</tr>
<tr>
<td>5</td>
<td>Visualization of the operations</td>
<td>Visualization of operations making it easier to understand the operations of the buses and transport conditions in real-time</td>
</tr>
<tr>
<td>6</td>
<td>Regulatory Indicators</td>
<td>Consolidation and harmonization of the timing and data collection of traffic conditions</td>
</tr>
<tr>
<td>7</td>
<td>Emergency Coordination</td>
<td>Consistency and response times of actions in emergency conditions</td>
</tr>
<tr>
<td>8</td>
<td>Subsidy support</td>
<td>Transparency in the payment of subsidies</td>
</tr>
<tr>
<td>9</td>
<td>Decision support</td>
<td>Degree of reliability of data for taking management decisions</td>
</tr>
</tbody>
</table>
## Quantitative analysis of the impact of standards

<table>
<thead>
<tr>
<th>Assessment aspects</th>
<th>Operational indicators</th>
<th>Quantifying of non-economic benefits</th>
<th>Explanations</th>
</tr>
</thead>
<tbody>
<tr>
<td>Operation</td>
<td>Average # of passengers per month</td>
<td>↑0.92%</td>
<td>Average monthly # of passengers increased by 0.92%.</td>
</tr>
<tr>
<td></td>
<td>Average punctuality of bus departure</td>
<td>↑2%</td>
<td>Punctuality of bus departures increased 1.2%.</td>
</tr>
<tr>
<td></td>
<td>Speed violations</td>
<td>↓9%</td>
<td>Speeding violations decreased by 9% .</td>
</tr>
<tr>
<td></td>
<td>Time required for the preparation of statistics</td>
<td>↓10%</td>
<td>Time savings in preparing statistics by 10% .</td>
</tr>
<tr>
<td></td>
<td># of staff managing the platform</td>
<td>↓6%</td>
<td># of dispatchers decreased by 6%</td>
</tr>
<tr>
<td>Service quality</td>
<td>Average waiting time</td>
<td>↓3.3%</td>
<td>Average waiting time of passengers decreased by 3.3%.</td>
</tr>
<tr>
<td></td>
<td>Passenger complaints rate</td>
<td>↓2%</td>
<td>Complaint rate of passengers decreased by 2%</td>
</tr>
<tr>
<td></td>
<td>Convenience of passengers</td>
<td>↑5%</td>
<td>Convenience of passengers increased by 5%</td>
</tr>
</tbody>
</table>
Conclusions (1)

➢ Qualitative impacts of standards

• Efficiency in the dispatch operations
• Real-time control operations
• Remote safety monitoring
• Operational guarantees
• Systematic monitoring of key performance indicators
• Evidence-based decision and planning support
• Increase in the determination of the exact amounts of subsidy payments
• Smart coordination of emergency situations
Quantitative impacts of standards

- Average monthly number of passengers increased by 0.92 %
- Punctuality rate of bus departures improved by 2 %
- Speeding violations decreased by 9 %
- Time needed for preparing statistics decreased by 10 %
- Number of dispatching personnel was reduced by 6 %
- Waiting time for passengers was reduced by an average of 0.4 minutes
- Passenger complaints decreased by 2 %
- Passenger convenience, based on surveys, was enhanced by 5 %.
Thank you!