Impact Evaluation of a Pilot Project on Evening Distribution in Stockholm

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Framtida Handel (1)

- An entirely new kind of alliance promoting a dialogue between companies, local authorities, regions and the government

- Designed to achieve sustainable development of trade in and production of everyday commodity goods

- The participants have decided jointly on long term goals and have agreed on a number of specific measures to be implemented

Source: www.framtidahandel.se
Framtida Handel (2)

- An agreement in the form of a policy document has been signed by all participants.

- Attached to the Agreement are 10 visions and goals on which all participants have agreed.

- They are supposed to guide the participants in their efforts to help achieve the environmental quality objectives laid down by the Swedish Parliament.

Source: www.framtidahandel.se
Framtida Handel (3)

- For example, the participants undertake to
  - Work together to promote sustainable distribution of everyday commodity goods
  - Use their efforts to implement the specific measures as set out in the policy document
  - Develop the sector and monitor the progress achieved
  - Evaluate the dialogue project
  - …

Source: www.framtidahandel.se
Pilot Project – Objectives and goals (1)

- The main objective with the pilot study was to investigate the effects of evening distribution in a city centre

- Is it possible to change the distribution system and
  - The impacts on the environment are reduced
  - The time used for a delivery route is reduced
  - The flow of goods is more evenly spread out over 24 hrs
  - The use of “invested capital” is increased (especially with respect to vehicles)
Pilot Project – Objectives and goals (1)

- If possible also indirect effects should be addressed
  - Can retailers in the city centre be stronger by means of more efficient distribution and less lead times (for orders)
  - Can the manning and the security during evenings be solved in a satisfactory way
  - Can the noise problem be addressed and other disturbances when loading/unloading be avoided
  - Can other business sectors learn from the experiences
Pilot Project – Project time plan

<table>
<thead>
<tr>
<th>Aktiviteter</th>
<th>2005</th>
<th>2006</th>
</tr>
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<tbody>
<tr>
<td>Fas 1 - Projektstart</td>
<td></td>
<td></td>
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<tr>
<td>Fas 2 - Nuläge</td>
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</tr>
<tr>
<td>Fas 3 - Kvällsdistribution</td>
<td></td>
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</tr>
<tr>
<td>Fas 4 – Kvällsdistribution med trängselavgift</td>
<td></td>
<td></td>
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<tr>
<td>Fas 5 – Kvällsdistribution utan trängselavgift</td>
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<tr>
<td>Fas 6 - Utvärdering</td>
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<td>X</td>
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<td>Fas 7 - Rapport</td>
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<td></td>
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<tr>
<td>Fas 2b - Referentest</td>
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X - indicates test periods planned
The Stockholm Trial
Test area and distribution routes
The Project Plan – and what happened in practice (1)

- At the end one test area and two wholesale companies were involved

- Delivery times between 17 and 20 in the evening were planned
  - In most cases the delivery times were 16-18
    - The main reason being that the possibilities for the retailers to receive the goods were limited

- A workshop and in-depth interviews with relevant stakeholders were performed
The Project Plan – and what happened in practice (2)

- Measurement of driving times, stop times, etc. before, during and after the Stockholm Trial
  - Before the Stockholm Trial
    - The evening distribution was delayed by one month (started in November 2005)
      - As a consequence less reliable measurements before the congestion charges were introduced
  - During the Stockholm Trial
    - One wholesale company faced problems with working hours (union protests) and too low load factors
      - Measurements planned for the Spring 2006 had to be performed in June-July 2006 (out of the original test period)

- Fuel consumption was calculated from driving logs, not measured
Stockholm Trial Results – Traffic flows

Source: Stockholm Trial – Final Report
Stockholm Trial Results – Changes in travel time

Source: Stockholm Trial – Final Report
Results from Pilot Project – Example 1

Time consumption in relation to the impact of the congestion charges, route 1

- Average time: 84 minutes
- Before charges: 79 minutes
- During charges: 83 minutes
- After charges: 93 minutes
Results from Pilot Project – Example 2

Time consumption for route 2, considering holidays

<table>
<thead>
<tr>
<th>Minutes</th>
<th>Average</th>
<th>Before charges</th>
<th>During Charges</th>
<th>After Charges</th>
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<tr>
<td></td>
<td>All days</td>
<td>Christmas and New Year holidays deleted</td>
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<td>75</td>
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</table>

Average time consumption before and after charges, considering holidays.
Results from Pilot Project – Example 3

Time consumption in relation to the impact of the congestion charges, route 1

- Average time: 54 minutes
- Before charges: 61 minutes
- During charges: 59 minutes
- After charges: 66 minutes

Simulated morning route
Results from Pilot Project – Example 4

Time consumption due to the starting time of route 1

- Average: 84 minutes
- 14-15: 83 minutes
- 15-16: 92 minutes
- 16-17: 82 minutes
- 17-18: 85 minutes
- 18-19: 71 minutes
- 19-20: 48 minutes
Results from Pilot Project – Example 5

Time consumption due to the starting time of route 1

Simulated morning route

Minutes

Average 8-9 18-19

61 67 33

Simulated morning route
Summary – Quantitative results (1)

- 10 minutes shorter trip time during the Stockholm Trial period compared to the period after the trials (total trip 84 minutes)

- Time used for delivery is 15 minutes less during the evening (18-20) compared to the afternoon (14-18)
  - Confirmed by "simulated" trips using a passenger car and comparing morning trips (8-9) with evening trips (18-19)
Stockholm Trial Results – Changes in average speed

Medelhastighet på innerstadens stomlinjer 07:30-08:30
Differens mellan våren 2006 och våren 2005

Source: Stockholm Trial – Final Report
Calculation of Emissions (1)

<table>
<thead>
<tr>
<th>Fuel</th>
<th>SK</th>
<th>VS</th>
<th>Grössenklasse</th>
<th>Konzept</th>
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<tbody>
<tr>
<td>Diesel</td>
<td>Highway</td>
<td>Highway_Stop+Go</td>
<td>MEDEL (14-26)</td>
<td>HDV/Euro3</td>
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<tr>
<td></td>
<td></td>
<td>(Speed 6 km/h)</td>
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<tr>
<td>NOx</td>
<td>17</td>
<td>[g/fkm]</td>
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<tr>
<td>PM</td>
<td>1</td>
<td>[g/fkm]</td>
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<tr>
<td>CO2</td>
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<td>[g/fkm]</td>
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<td>Urban_Main road4</td>
<td>MEDEL (14-26)</td>
<td>HDV/Euro3</td>
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<td>Main road / right of way / major hold ups (Speed 18 km/h)</td>
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<td>PM</td>
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<tr>
<td>CO2</td>
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<td>[g/fkm]</td>
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<td>MEDEL (14-26)</td>
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<td>[g/fkm]</td>
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</table>

## Calculation of Emissions (2)

<table>
<thead>
<tr>
<th>Type of emission</th>
<th>Reduction: Evening vs. Afternoon</th>
<th>Reduction: Evening vs. Rush hours</th>
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<tbody>
<tr>
<td>NOx</td>
<td>20%</td>
<td>NOx</td>
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<tr>
<td>PM</td>
<td>26%</td>
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<tr>
<td>CO2</td>
<td>21%</td>
<td>CO2</td>
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</table>
Summary – Quantitative results (2)

• The environmental load is calculated to be reduced at least in the order of 20% per vehicle when involved in evening distribution

• Potential possible positive side effects of less congestion due to changes in delivery times has not been possible to address
Qualitative results (1)

- The willingness of shop owners to change and adapt their business for evening distribution is a key issue
- The ability of the transport company to effectively plan new routes during evening hours is another key issue
- It is easier to load/unload in the loading bays due to fewer lorries queuing in line for delivery
- More passenger cars are blocking the loading/unloading zones during evening hours
- Overall there is less stress experienced by the drivers
Qualitative results (2)

- The following advantages can be reported
  - Better reliability in the deliveries
  - Deliveries are made with leeway for the shops
  - The shops are less restricted in time use
  - Better use of the personnel in the shops
  - Better use of the vehicle fleet
Qualitative results (3)

• The following drawbacks can been reported
  – Changed working hours for both drivers and shop personnel
  – Difficulties to correct errors in orders made
  – Less help from shop personnel when drivers are unloading in the evening
  – There is a risk for higher costs (both for retailers and wholesalers)
  – The power of tradition is strong
Evaluation Experiences (1)

- At the end we got enough quantitative data to say something about the trip times
  - As an “added value” from how the pilot project was finally implemented and conducted we could also say something about afternoon vs. evening distribution

- We have collected interesting qualitative data and got experiences from distribution in the evening that could not have been foreseen
  - These findings would not have been gathered if the pilot project had not been “adapted to the real life situation”
Evaluation Experiences (2)

• Our laboratory is the "real life" and it cannot be controlled or corrected afterwards
  – Unforeseen incidents happen
  – Negative experiences are as important as positive

• Problems in "real life" have to be faced and solved
  – We learn more from the implementation of ideas than from what simulation models can provide
  – The principle of "learning by doing" is applied

• The inductive evaluation approach used was a success
Concluding remarks (1)

• It is important to evaluate the effects with enough strength and competence
  – The evaluation budget must be of a reasonable size
  – Reporting both positive and negative results must be made with transparency (for future use)
• All “facts” are needed for a transferability analysis to be performed
Concluding remarks (2)

- The project budget must include a buffer to cope with the necessary changes in the project plan
  - Relevant for all parties involved (especially for the project management)
  - A pilot project where stakeholders are involved must be given enough calendar time (for agreements, acceptance and for the promotion of active participation)