Benefits of common address reference data
- experiences and assessments

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Benefits of common address reference data - experiences and assessments

Nordic countries

Denmark

- 5.4 million inhabitants
  ~ Maryland or Wisconsin
- Area: 17,000 sq.mi.
  ~ Maryland or West Virginia
- Capital: Copenhagen
- 108,000 named roads
- 2.4 million addresses
Agenda

• Introduction
  – Addresses as part of society's infrastructure
  – Addresses and address data in Denmark

• The true value of addresses?
  – Three examples of value assessments
  – 1. Case study on address data in postal services
  – 2. Business case study on public webservices on addresses
  – 3. Cost/benefit analysis on improvement of address system

• Conclusions and perspectives
Infrastructure: "A set of interconnected structural elements that provide the framework for supporting an entire structure …" (e.g. a city, nation or corporation). Wikipedia

The concept of street names and addresses is a valuable addition to the street network infrastructure.
Infrastructure for Spatial Data (and e-Gov)

"INSPIRE" and B. Hulegaard et al: "Base Data Report", Copenhagen, 2004

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Development of address system 1995-2007

- **Address geo-coding process (points)**
  - Voluntarily by all municipalities; supported by government

- **Enforced and clarified address legislation**
  - Giving authority to local government within one act of law

- **Simplifying recording of address data**
  - By the municipalities into a single address register

- **Free of charge data agreement**
  - Agreed by Dept., of Finance and local governments 2002
  - Result: Most national applications/sectors uses address register data as a common reference
I. Case study on Postal services

The Post Denmark Example
- using address data
to improve efficiency
The postal process ...

Address information are used in all stages of the postal process ...

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The traditional approach

Postcode system was introduced by Post Danmark in September 1967
Automatic sorting is based on OCR plus reference data on all addresses receivers, and distribution routes. In 1st sorting, letters are “stacked” by final distribution route – and in correct order!
Result: Efficiency based on address data

OCR hit-rate, sorting and route planning is based on the accessibility of high quality address reference data.
In 2004-2005: The "TOR-project" extended the use of address reference data's spatial components (address points) in a single postal process: optimized route planning.
TOR-project: Examples from the optimization process
Extract from newspaper article from December 2004, quoting a net. 3.3 % reduction of all costs in the 1st year of project and a 100 % ROI within 1-2 years! (Web version of “Fyns Stifttidende” December 3rd 2004)

This improvement of Post Denmark’s benefit (profit) is too based on accessibility of high quality address reference data.
2. Business case analysis: Common Address Webservices

Providing address reference data as a service oriented component
The concept of address web services

Private sector

IT-1
IT-2
IT-3
IT-4

E-Gov infrastructure

CRC  CBR  LR  AWS  MAP  CAD  Plan  ENV

User Application

User Application

User Application

Internet

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Business case report 2005

+ Benefit from providing access to public data via WS
  - simplifies it-development, maintenance etc.

+ Benefit from using common address reference data
  - max reliability, max interoperability, frequent updates

Result (conservative): 4,5 mill. US$ / first 3 years
3. Cost benefit analysis: Improvement of the address system

“The problem of ambiguous road names”
The scope of the analysis

The Address system is an important element in society’s infrastructure
The issue

*Unambiguousness is one of the most important properties of an address system.*

If addresses are not unambiguous, the result will be mis-interpretations, uncertainty, delays and errors with negative impact, both for the citizens and enterprises who are affected, and for the authorities and business entities that makes the mistakes.

In Denmark, normally the information on *Road name and postcode* is sufficient to find a specific road or street. Similar, the information on *Road name, address number and postcode* is normally sufficient as a reference to a specific address.

*Normally a three-element address is therefore unambiguous.*
The issue (cont ...)

*But for approximately 0.7% of all addresses, this is not the case, because the road name exists more than once within the postcode.*

It is not a new problem. The situation has its roots in years when the postcode system was first introduced around 1967.

Until now people have tried to cope with the problem by submitting an extra identifier of the place name (typically the name of the village) in a 4th address line between the street and the postcode.

*In these situations an address is composed by four elements: Road name, address number, additional place name and postcode.*

*Experiences show that this solution is very in-efficient and has several negative impacts.*
Examples

In Postcode 7100 Vejle there are two streets named "Gl. Landevej" (Old Main Road):
- in the village "Lindved"
- in the suburb "Mølholm"

The additional place names "Lindved" and "Mølholm" are absolutely necessary if you must distinguish, for example for addressing a letter or when an ambulance is dispatched.
Examples (cont …)

In postcode 8900 Randers the road name "Egevej" (Oak Drive) is used four times:
- in Assentoft
- in Haslund
- in Harridslev
- in Øster Bjerregrav
Consequences

Lisbeth's husband died: Ambulance dispatched to wrong city

Alarmcentral sendte brandbiler til forkert adresse

"Emergency center dispatched firefighters to wrong address"
Concept of the cost benefit analysis

\[ \frac{\text{What is the negative impact for society?}}{\text{What are the costs of the solution?}} \] = Result

\[ \text{Is there an alternative? – and what are the costs?} \]
Analysis of negative impact

What is the negative impact for society?
= what is the value (benefit) of solving the problem?

Qualitative analysis:
- Interviews with households and businesses
- Collection of real life examples ...

Quantitative analysis:
- Estimation of negative, economical consequences (loss)

Must show that people in real life experience problems and potential loss

Must show that society (citizens, business etc.) has measurable loss or extra costs, caused by the problem
Interviews

Has experienced mistakes (pct.)

<table>
<thead>
<tr>
<th></th>
<th>Post</th>
<th>Deliver. goods</th>
<th>Visits</th>
<th>Ambulance, police fire</th>
</tr>
</thead>
<tbody>
<tr>
<td>Total</td>
<td>68</td>
<td>26</td>
<td>6</td>
<td>26</td>
</tr>
<tr>
<td>Citizens</td>
<td>70</td>
<td>25</td>
<td>7</td>
<td>22</td>
</tr>
<tr>
<td>Business</td>
<td>61</td>
<td>32</td>
<td>2</td>
<td>36</td>
</tr>
</tbody>
</table>

Benefits of common address reference data - experiences and assessments
Real life examples ... (just two)

No letters from hospital regarding child’s heart disease
The family has a child with a serious heart disease. The child receives treatment from a major hospital in the region. The hospital often sends letters with schedules for treatment, meetings with doctors etc.

Some of the letters are delivered to the wrong address, and some are delayed, with the result that the child misses the scheduled treatment.

The family are frustrated and don’t know what to do. They are also uncomfortable, knowing that the people at the wrong address is receiving their private correspondence with the hospital. They are in a dialogue with the hospital, but the hospitals claims, that their it-system is not capable of managing the extra place name in the address.

19 tons bricks delivered to wrong address in a dwelling area
An entrepreneur has ordered 19 tons of bricks for a construction work. The bricks was delivered at the wrong address, which is situated in a dwelling area, while the owners were at work. The transport company and the entrepreneur had many discussions before the situation was clarified.
# Quantification (example on post delivery)

<table>
<thead>
<tr>
<th>A</th>
<th>B</th>
<th>C</th>
<th>D</th>
<th>E</th>
<th>F</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Letters and parcel delivery</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>12PD</td>
<td>12PD</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Danish letters/year (2004)</td>
<td>1,300.00</td>
<td>1,300.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Post Danish parcels/year (2004)</td>
<td>35.00</td>
<td>35.00</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Addresses not unambiguous in % of all</td>
<td>0.8%</td>
<td>10.40</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Frequency in mistakes caused by the problem</td>
<td>15.0%</td>
<td>1.56</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td><strong>Negative value of delays (example)</strong></td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letters</td>
<td>Fraction</td>
<td>Items (mic./year)</td>
<td>US$ / Item</td>
<td>Total (mic US$)</td>
<td></td>
</tr>
<tr>
<td>a) No impact</td>
<td>90.0%</td>
<td>1.40</td>
<td>0.00</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>b) Some impact</td>
<td>80.0%</td>
<td>0.12</td>
<td>1.00</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>c) Major impact</td>
<td>2.0%</td>
<td>0.03</td>
<td>18.00</td>
<td>0.6</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>1.56</td>
<td>0.7</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Parcels</td>
<td>Fraction</td>
<td>Items (mic./year)</td>
<td>US$ / Item</td>
<td>Total (mic US$)</td>
<td></td>
</tr>
<tr>
<td>a) No impact</td>
<td>90.0%</td>
<td>0.04</td>
<td>0.00</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>b) Some impact</td>
<td>80.0%</td>
<td>0.00</td>
<td>10.00</td>
<td>0.0</td>
<td></td>
</tr>
<tr>
<td>c) Major impact</td>
<td>2.0%</td>
<td>0.00</td>
<td>90.00</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td>100.0%</td>
<td>0.04</td>
<td>0.1</td>
<td>0.1</td>
<td></td>
</tr>
<tr>
<td>Ekstra costs of error management (Post DK)</td>
<td></td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Letters</td>
<td>100.0%</td>
<td>1.56</td>
<td>0.15</td>
<td>0.2</td>
<td></td>
</tr>
<tr>
<td>Parcels</td>
<td>100.0%</td>
<td>0.04</td>
<td>10.00</td>
<td>0.4</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>0.7</td>
<td>0.7</td>
<td></td>
</tr>
<tr>
<td>Total</td>
<td></td>
<td></td>
<td>1.4</td>
<td>1.4</td>
<td></td>
</tr>
</tbody>
</table>
112 (US 911): Estimation of negative impact

1) It is agreed, that the problem with non-ambiguous road names results in **extra time** needed to ensure that the correct address is selected as well as an **extra risk** that the 112-centers select the wrong address for dispatching.

2) In 2005 “Alarm 112” had 431,437 calls and 147,830 dispatches of ambulances. **1,900** of these were targeted at an address with the problem; Thus the extra time consumption and risk occurs **5 times a day!**

3) Different assessments (from counties and hospitals) estimates that there **10-20 times a year** occurs mistaken dispatches caused by the problem. 112 does not find this figure unrealistic.

4) It is estimated that 15 % of all 112-emergencies concerns potential life-threatening incidents, it is estimated that delays and mistakes caused by the problem, **1-3 times per year will lead to death or severe injury.**
Final result of analysis

This section outlines the benefits of using common address reference data, and assesses the viability of solutions.

### Value (benefit) of not having the problem

3.5 million US$ per year.

### Cost of Solution

- **Public sector alone:** 1.5-2.5 million US$ for 5 years.
- **Alternative:** 350 million US$ for 5 years.

### Calculation

- **Public sector IT systems alone:** 30 million US$.

### Result

**Problem should be solved**
Perspektivet i analysen

The address system:

Value of a repair:
~ +3,5 mill. US$/year

... Can justify an investment of
~ 14-16 mill. US$

Gives a picture of the total value of the address system
A new “Statuary order on unambiguousness of road names” will in an annex, list the 426 roads, for which the municipality must assign a new name in order to avoid the duplicates.

The work should be finalized July 1st 2008.
Perspectives

Measuring the value of the addresses

– Is basically a challenge of assessment of infrastructure
– Which is like assessing value of clean air or green forests …
– Which is not easy at all …
– Because the value to human life is almost infinite …
– And because it’s not only a question of Dollars or Euros
– But also the question of citizens comfort, wellbeing and safety
– Is though necessary, when you shall justify the cost/investment of a certain improvement or development
Thank you

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