Traffic Data Coordination and Integration: The City of Edmonton Experience

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City of Edmonton Office of Traffic Safety

- Established through Mayors Task Force 2006
- First Municipal Office of Traffic Safety in North America (perhaps Globally?)
- Under Transportation Services
- Focus on Urban Traffic Safety
- Organize Annual International Urban Traffic Safety Conference since 2009
- Work Closely with Worldwide Traffic Safety Experts
  - Montana State University, USA
  - Monash University, Melbourne, AU
  - Queensland University of Technology, Brisbane, AU
  - Ryerson University, Toronto, Canada
  - University of British Columbia, Canada
  - University of Calgary, Canada
  - University of Alberta, Canada
Agenda

- Motivational Examples and UN Decade of Action for Road Safety 2011-2020
- Data Silos
- City of Edmonton Traffic Data Coordination Committee
- Spatial Business Intelligence
- First Year and Five Year Plan of Data Integration
- City of Edmonton and IBM Smarter City Challenge
Deployment of Intersection Safety Cameras

- Signalized Intersections
- Number of Approaches
- Number of Lanes
- Turning Movement Counts
- Number and Type of Collisions
- Intersection Violations
Increasing Demand for Traffic Safety Data

There is a growing awareness among traffic safety professionals that a **multidimensional systems approach** is required to effectively address traffic safety issues. Instead of focusing on one element of traffic safety (engineering, enforcement, or education), there is a need to build bridges and relationships among all the elements that affect traffic safety, and to understand how the various elements affect each other at all times.

(Zein and Navin, 2003)
Integrated License Plate Intelligence

City of Edmonton:

<table>
<thead>
<tr>
<th>Vehicle License #</th>
<th>Intersection Safety Offences</th>
<th>Speeding Offences</th>
<th>Total Offences</th>
</tr>
</thead>
<tbody>
<tr>
<td>XXXXXX1</td>
<td>28</td>
<td>8</td>
<td>36</td>
</tr>
<tr>
<td>XXXXXX2</td>
<td>28</td>
<td>5</td>
<td>33</td>
</tr>
<tr>
<td>XXXXXX3</td>
<td>24</td>
<td>8</td>
<td>32</td>
</tr>
<tr>
<td>XXXXXX4</td>
<td>24</td>
<td>4</td>
<td>28</td>
</tr>
<tr>
<td>XXXXXX5</td>
<td>17</td>
<td>10</td>
<td>27</td>
</tr>
<tr>
<td>XXXXXX6</td>
<td>12</td>
<td>15</td>
<td>27</td>
</tr>
<tr>
<td>XXXXXX7</td>
<td>13</td>
<td>12</td>
<td>25</td>
</tr>
<tr>
<td>XXXXXX8</td>
<td>14</td>
<td>11</td>
<td>25</td>
</tr>
<tr>
<td>XXXXXX9</td>
<td>19</td>
<td>6</td>
<td>25</td>
</tr>
<tr>
<td>XXXXXX10</td>
<td>4</td>
<td>20</td>
<td>24</td>
</tr>
</tbody>
</table>

Victoria Police report:

<table>
<thead>
<tr>
<th>License Plate</th>
<th>Vehicle</th>
<th>Number of infringements</th>
<th>History</th>
</tr>
</thead>
<tbody>
<tr>
<td>WJB129</td>
<td>Private vehicle</td>
<td>177</td>
<td>Claims to suffer from ADD and cannot pay attention to changes in speed limits.</td>
</tr>
<tr>
<td>XXXXXXX</td>
<td>Numerous different vehicles registered to friends</td>
<td>140</td>
<td>Criminal offending and significant assault history</td>
</tr>
<tr>
<td>XXXXXXX</td>
<td>Currently registered</td>
<td>120</td>
<td>Significant traffic history – drive whilst disqualified, suspended, drive unregistered vehicle, drive manner dangerous. Extensive criminal history and jail time</td>
</tr>
</tbody>
</table>

- Data Driven Approaches to Crime and Traffic Safety (DDACTS)
- Impaired Driving Research
- Medically-At-Risk Driver Research

http://www.rsconference.com/pdf/R20106661.pdf?check=1
UN Decade of Action 2011-2020 ‘Five Pillar’ Plan:

1. Building Capacity for Road-Safety Management
2. Encouraging Safer User Behavior
3. Building Safer Roads
4. Building Safer Vehicles
5. Improving Post Collision Care

Timely, consistent, complete, accurate, accessible and integrated data
Data Silos

- Inadequate knowledge about the existence of various data and their availability,
- Lack of linkages with other databases resulting in duplicate data collection, processing and management,
- No standardized method for the specific identification of attributes across data sources,
- Lack of communication among stakeholders of important changes to the data, and
- Lack of access to other data systems

Modified from the original picture shown in http://blogs.sun.com/bblfish/entry/business_model_for_open_distributed
Traffic Data Coordination Committee

Policy direction, strategic and tactical needs

Recommended operational needs and actions (e.g., standardized format, critical data, data collection and analysis procedures)

Program oversight

University of Alberta, Canada
TDCC Mission

To provide leadership and integrated traffic data system that create

- timely,
- consistent,
- complete,
- accurate, and
- accessible

information that meets strategic, tactical and operational needs of all stakeholders.
City of Edmonton Strategic Implementation

**APPROACH**

- Safe Road Users
- Safe Roads & roadsides
- Safe Vehicles
- Safe Speeds
- Safe System Foundation

**GOALS**

- **Target 1**: Reduction in serious injury/fatality collisions (40%)
- **Target 2**: Reduction in High-Risk Driver Behaviours
  - 95% seat belt wearing rate
  - Repeat offenders
  - Distracted driving etc.
  (5%)
- **Target 3**: Impaired Driving: alcohol, illegal drugs, prescription drugs, cognitive impairment (aging population)
  Specific baseline and target to be established (15%)
- **Target 4**: Speed Management (safe system roadways)
  Specific baseline and target to be established (40%)

**VISION**

Zero fatalities, and serious injury collisions
Traffic Data Integration

- Enforcement durations
- Traffic counts
- Offence statistics
- Issued tickets statistics
- Locations

- Traffic volume
- Turning movement counts
- Speed surveys

- Roadway collisions
- Roadway inventory

- Speed & traffic complaints
- Road conditions
- Roadway maintenance

- Motor Vehicle Collision Information System (MVCIS)
- Spatial Land Inventory Management (SLIM)
- Traffic Complaints System (Enterprise Solution 2011)
- Transportation Operations

- Automated Enforcement (Intersection Safety Cameras and Photo Radar Cameras)
- Environment Canada
- Federal Census
- Edmonton Police Service
- Transit
- Transit Safety & Security

- Weather conditions
- Demographic statistics
- Manned enforcement
- Impaired driving
- Crime statistics
- Shift schedules
- Accidents/incidents
- Bus Stops & routes
- Passenger counts
Motor Vehicle Collision Information System

- Oracle Database
- Java-based Application
- Data Back to 1992
- Location detail:
  - Intersection + portion code
  - Mapped interchanges
- Canned Reports:
  - New reports come from IT (~6 mo)

Source: Chris Neuman, Collision Reporting, COE OTS, Jan 2011
Business Intelligence (BI) refers to a combination of

- technology,
- applications,
- methods, and
- practices

to organize the key information that organizations require to understand and improve business processes and performance (Williams and Williams, 2007)
Business Intelligence – Collision Data

- 2009 – in-house work in Web Intelligence
  Rich Client tool from SAP Business Objects / WebI
- 2010 – rollout to users
Benefits of Business Intelligence

(Eckerson, 2003)
Filters and parameters have been used to filter data based on a textual view of the values available to be filtered on.
Traffic Data - Spatial Integration

Data Layers:
- Location of Bars and Nightclubs
- Location of Collisions
- Location of Intersection Safety Cameras
- Roadway Inventories
- Location of Traffic Surveys
- Traffic Safety Corridors
- Bus Routes
Integration Platform

Spatial Business Intelligence (SBI) supports traditional and spatial data through merging Geographic Information Systems (GIS) and Business Intelligence (BI) technologies.
Spatial Business Intelligence

User can create a spatial bounding boxed directly on a map to filter the data and get a nice report.
Data Integration Project Scope

- The development of a 5 Year Traffic Data Integration/Release Plan
- The development of target architectures
- The development of an initial release
Year 2011 Release

Business Intelligence Framework

Automated Enforcement (Intersection Safety Cameras and Photo Radar Cameras)
- Enforcement durations
- Traffic counts
- Offence statistics
- Issued tickets statistics
- Locations

Traffic Count Management (TCM)
- Traffic volume
- Turning movement counts
- Speed surveys

Motor Vehicle Collision Information System (MVCIS)

Spatial Land Inventory Management (SLIM)

Traffic Complaints System (Enterprise Solution 2011)

Transportation Operations

Roadway inventory

Roadway collisions

Speed & traffic complaints

- Road conditions
- Roadway maintenance

Weather conditions

Demographic statistics

- Manned enforcement
- Impaired driving
- Crime statistics
- Shift schedules

Edmonton Police Service

Transit Safety & Security

Transit

Accidents/incidents

- Bus Stops & routes
- Passenger counts

Federal Census

Weather conditions

Canada

Environment

Edmonton Police Service

Transit Safety & Security


Stevanus Tjandra, Ph.D.
August 1, 2011
## Year 2011 Release

### Example: Linking Collision, Speed Survey and Roadway Inventory Data

<table>
<thead>
<tr>
<th>Traffic Survey Location</th>
<th>Functional Class</th>
<th>Neighbourhood</th>
<th>Speed Limit</th>
<th>Location Quadrant</th>
<th>AADT</th>
<th>Average Speed</th>
<th>Mode Speed</th>
<th>85th Percentile Speed</th>
<th>Compliance Rate at Posted Speed (%)</th>
<th>% Vehicles Exceeding Speed Limit</th>
<th>% Vehicles At or Exceeding Speed Limit+5</th>
<th>Collisio Location Name</th>
<th>Roadway Portion</th>
<th>Collisio Report Year</th>
<th>Collisio Report Month Name</th>
<th>Collisio Report Day</th>
<th>Collisio Type Name</th>
<th># Collisions</th>
</tr>
</thead>
<tbody>
<tr>
<td>69 AV WO 178 ST</td>
<td>Arterial</td>
<td>Lymburn</td>
<td>60</td>
<td>South West</td>
<td>1399</td>
<td>64</td>
<td>60</td>
<td>72.56</td>
<td>31.46%</td>
<td>68.54%</td>
<td>21.24%</td>
<td>MID AVENUE NW &amp; 178 STREET NW</td>
<td>2010</td>
<td>AUGUS T</td>
<td>26 PROPERTY DAME</td>
<td>1</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Ormsby Place</td>
<td>60</td>
<td>South West</td>
<td>1399</td>
<td>64</td>
<td>60</td>
<td>72.56</td>
<td>31.46%</td>
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<td>1</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Stevanus Tjandra, Ph.D.  
August 1, 2011  

Five Year Plan

- Integrating business intelligence and geospatial

Business Intelligence Tool
- Data/Report
- Map
- Dashboard

Spatial Tool
- POPULATE
- SELECT
- POPULATE
- POPULATE
- POPULATE
- POPULATE
- POPULATE
- POPULATE

- Google Maps
- Oracle MapViewer
- SLIM Maps
- ??....

- Site – Traffic Volume
- Collision
- Bus Stop
- etc

- Bi Data Marts
- Oracle Spatial

- Moving from traditional business intelligence / historical analytics
to real-time analytics and predictive analytics
A real-time traffic conflict analysis combined with historical traffic flow and collision patterns as well as weather information can be used to provide real-time prediction of collisions and traffic congestion for more accurate collision warning and avoidance guidance and smarter route choice guidance for drivers.
City of Edmonton and IBM Smarter City Challenge

“The City of Edmonton is well-positioned to be a global leader in smarter urban traffic safety”

comments relating to COE OTS by IBM Smarter Cities Team.

Two relevant IBM recommendations:

- Create an Analytics Centre of Excellence to support a Road Safety data governance model and analytics leadership
- Further support open government and open data for traffic safety and transportation

http://smartercitieschallenge.org/index.html
Traffic Safety Problem?

or

Data Problem?
Thank You