Advanced GIS Applications in Transit

Case Studies of Five Large Transit Agencies

presented to
GIS in Transit Conference

presented by
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Cambridge Systematics, Inc.

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Transportation leadership you can trust.
Presentation Overview

Scope
- To provide a summary of advanced applications of GIS in transit
- Based on TCRP Synthesis Project, Report 55 published in December 2004

Methodology
- Case studies of 5 large transit agencies
  - Agencies selected in consultation with TCRP Expert Panel
- Conducted alongside review of GIS in transit surveys (Bridgwater College and FTA)
Case Studies

- Chicago Transit Authority
- King County Metro
- Miami-Dade Transit
- New Jersey Transit
- TriMet, Portland
## Case Studies: Summary of GIS Deployment

<table>
<thead>
<tr>
<th>GIS Unit Location</th>
<th>Transit Agency</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Chicago TA</td>
</tr>
<tr>
<td>GIS Staff</td>
<td>2.5</td>
</tr>
<tr>
<td>GIS Users</td>
<td>66</td>
</tr>
<tr>
<td>GIS Applications</td>
<td>12</td>
</tr>
</tbody>
</table>

| GIS Platforms         | Planning   | King Cty GIS   | Information Technology | Policy & Technology | Information Technology |
|                       | ESRI, TransCAD, Oracle Spatial | ESRI, Autodesk | ESRI, MapInfo, TransCAD | Intergraph, Oracle Spatial, MapInfo, TransCAD | ESRI, MapInfo, Autodesk |

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### Case Studies: Application Areas

<table>
<thead>
<tr>
<th>Application</th>
<th>TriMet</th>
<th>King County</th>
<th>NJ Transit</th>
<th>Miami-Dade Transit</th>
<th>CTA</th>
<th>No. of Responses</th>
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</thead>
<tbody>
<tr>
<td>Service Planning</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Market Analysis</td>
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<td>x</td>
<td>x</td>
<td></td>
<td>x</td>
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<tr>
<td>Map Production</td>
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<td>x</td>
<td>x</td>
<td>x</td>
<td>x</td>
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<tr>
<td>Fixed route scheduling</td>
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<td>Interactive itinerary travel</td>
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<tr>
<td>Ridematching</td>
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<tr>
<td>Turnstile/Platform data collection</td>
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<tr>
<td>Onboard vehicle data collection with GPS</td>
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<tr>
<td>Automatic Passenger Counting</td>
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<tr>
<td>Display of Automatic Vehicle Location</td>
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<tr>
<td>Real-Time Bus Display</td>
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<td>Paratransit scheduling and dispatching</td>
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<td>Real Estate asset management</td>
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<td>Police Operations</td>
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<td></td>
<td>x</td>
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<td>ADA compliance</td>
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<td>x</td>
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<tr>
<td>Title VI of Civil Right Act</td>
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<td>Welfare to work</td>
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<td>Human services</td>
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<tr>
<td>New Starts supporting land criteria</td>
<td>x</td>
<td>x</td>
<td></td>
<td></td>
<td>x</td>
<td>3</td>
</tr>
<tr>
<td><strong>Total GIS Applications (max = 20)</strong></td>
<td>13</td>
<td>15</td>
<td>11</td>
<td>7</td>
<td>14</td>
<td></td>
</tr>
</tbody>
</table>
What Is An Advanced Application?

- Advanced applications integrate GIS with other IT systems and provide comprehensive analysis or data management capabilities.

Examples:

- Automated Vehicle Location (GPS, wireless communications, GIS)
- Trip Itinerary Planning Systems (trip planning software, RDBMS and GIS)
- Enterprise Spatial Data Management to support operations, planning and management (Regional Transit Database, GIS, Intranet/Internet)
- Spatial Multimedia for Planning Support (GIS, multimedia, planning software)
Example: GIS Enterprise Application
GIS Transit Data Integration
Example
## GIS Deployment in Transit Agencies

<table>
<thead>
<tr>
<th>Applications</th>
<th>Average GIS Staff</th>
</tr>
</thead>
<tbody>
<tr>
<td>Basic mapping, data analysis</td>
<td>0 - 2</td>
</tr>
<tr>
<td>GIS applications, databases to support Core planning and scheduling functions</td>
<td>2 - 4</td>
</tr>
<tr>
<td>Enterprise GIS applications and Databases including Web-map interfaces to support planning, scheduling, operations, Management/decision support and Customer oriented programs</td>
<td>5 +</td>
</tr>
</tbody>
</table>

**Project**

**Department**

**Enterprise**
Benefits of GIS

- **Visualization** and presentation of spatial phenomena (e.g., routes/stops);

- **Integration** of geographic data from diverse sources based on geographic location (e.g., ridership, population, employment); and

- **Analysis** of location considerations for market analysis and customer service
Transit Business
Transit is different form other transportation modes

Data
- Unique data requirements for routes, stops, schedule information (timepoints), ridership, vehicle tracking
- Commercial sources not available

Organization
- Transit business model a mixture of commercial and public service objectives
- Customer driven (passengers, policy makers, community)

Operations
- Focus on operations before planning and maintenance
GIS Implementation Issues in Transit Resources

- Funding GIS from within traditional budgets
  - Project, Department or Enterprise Activity

- GIS unit location
  - Planning, Operations or IT?
  - Turf Issues?

- Staff/HR issues
  - Status of GIS staff (are they transit analysts or IT professionals?)
  - Professional development
GIS Implementation Issues in Transit Standards

**Competing standards in different domains**

- **GIS**
  - FGDC Geospatial One Stop
  - ISO Geographic Data Format
  - Open Geospatial Consortium (OGC)

- **ITS**
  - FHWA Final Rule
  - ISO Location Referencing Message Specification
  - IEEE/APTA Communication Protocols for ITS
GIS Implementation Issues in Transit Software

- **Proprietary Software**
  - Compatibility of GIS with scheduling and trip planning programs

- **COTS vs Customized Applications**

- **Most common GIS programs:**
  - ESRI (ArcView 3.x, 8.x)
  - MapInfo
  - Geomedia
  - Autodesk
  - TransCAD
GIS Implementation Issues in Transit Recognition

- A lot happening in transit GIS but not being reported or recognized
- No forum for transit GIS information distribution
- 3rd GIS in Transit conference 2005
  - Six years since the last one in 1999
Summary

• GIS a core technology in transit
  • 74% of transit agencies using GIS
  • Enterprise systems integrate IT/GIS

• GIS applications expanding into operations and customer service

• Transit one of the more innovative users of GIS in transportation
  • Transit has unique characteristics for data and operations research
  • ITS applications