Smarter Transportation Management

An Opportunity for Government to Think and Act in New Ways: Smarter Transportation and Traffic Safety

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The Realities

1. Ever increasing demand while budgets and expansion are constrained

2. Transportation maturity directly impacts economic vitality

3. High expectation to deliver quality services and timely information

4. Service reliability and quality key to improving ridership

5. Basic obligation to keep citizens safe and manage incidents fast

“Worldwide transportation infrastructure is already overburdened and demand is expected to rise at 2x population growth”
- US DOT Statistics

“By increasing commuting speed by 10%, LA’s transit system increased productivity by 2-3% or by $1.1 – $1.6 billion per year”
- transportation4america

Traffic congestion costs the EU more than €100B/year (1% of GDP)
- Source US DOT

Nearly 1.24M people were killed on the world’s roads in 2010
- WHO Statistics

AASHTO/APTA report: U.S. needs $163 billion annually to fix aging transportation infrastructure
- IBM
Opportunity for transformative change in transportation systems and public safety through data analytics

To deal with:  There is the opportunity to:  So we can:

Tight budgets  Better predict demand  Do more with less
Improve efficiency  Improve transportation experience

Overburdened systems  Enhance capacity, assets and infrastructure  Enhance safety and security

Rampant urbanization  Improve end-to-end experiences  Protect the environment
Reduce congestion

Population growth  Empower citizens  Drive economic vitality and competitiveness

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...the connections drive budget, revenue, safety and citizen satisfaction

- Easing traffic congestion improves emergency response
- Fewer Road Construction Road Closures Mean Less Congestion
- Public Safety increases use of public transit
- Safer Transit Means Fewer Hospitalizations
- Public Works
- Govt Services & Education
- Transportation
- Healthcare
- Energy
Example Key Stakeholders in a Transportation Domain
Intelligent Transportation: **Overview**

**The Need** *(chief of transportation operations, head of transit operations & planning)*

- Reduce operation costs, increase revenue
- Reduce traffic congestion
- Improve performance against transit schedule
- Respond faster to incidents, improve citizen advisory

**Example Solution Scenarios**

**Traffic**

- Collect traffic data, analyze, present: real-time visibility, historical patterns, predictive inferences to traffic operators and planners

**Transit**

- Collect location & time table data, analyze, present: real-time visibility, vehicle arrival prediction inferences to transit operators and planners

**Smarter decisions enabled:**

- Traffic congestion & incidents identified, addressed rapidly
- Resources are used & deployed proactively, efficiently
- Rapidly respond: public transit re-routing, schedule changes
Example Case: A turnpike authority manages the roadway from a unified interface, speeding reaction times & improving traffic flow

Boosts productivity
by enabling the same number of operators to control and manage more devices

Helps prevent
secondary accidents by allowing operators to take fast, proactive measures to warn motorists

Eases congestion
by enhancing awareness and giving operators more and faster control of signs

>96% accuracy
for 30-minute-out traffic predictions in early live tests

Business challenge: Secondary accidents, typically rear-end collisions, are a primary concern for highway operators. Warning motorists in advance of stopped or slowing traffic can help avert tragedy and congestion—assuming operators have the ability to react. This US turnpike authority, overwhelmed with managing too many disparate traffic screens and devices, was increasingly challenged to maintain traffic flow, alleviate congestion and warn drivers of trouble ahead.

The smarter solution: The authority deployed a system that centralizes and analyzes traffic data, giving operators a unified interface for controlling 900 signs and a holistic view by which to monitor traffic events and conditions. Traffic speeds are visually represented on a central matrix board, helping operators recognize and proactively warn motorists of bottlenecks. In the future, when the solution detects congestion, it will automatically trigger alerts and provide recommendations for remedial action.

Operators can change multiple signs and warn motorists with unprecedented speed and efficiency, giving drivers enough time to find alternate routes.
## Intelligent Transportation Center Sample business outcomes

<table>
<thead>
<tr>
<th>Reduced cost of operations and increased revenue and ridership</th>
<th>Reduced congestion, reduced schedule misses and faster response to incidents</th>
<th>Improved citizen safety and satisfaction</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>10–15%</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
<td><strong>10–20%</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
<td><strong>50–80%</strong>&lt;sup&gt;*&lt;/sup&gt;</td>
</tr>
</tbody>
</table>
| • Improved operating expenditures through integrated asset management  
• Improved revenue  
• Reduced inventory carrying costs  
• Improved ridership (10–15 percent)                              | • Improved traffic flow, more capacity with current infrastructure  
• Less gridlock  
• More on-time arrivals                                             | • Faster response to incidents  
• Reduction in citizen complaints  
• Fewer accidents  
• Reduction in average travel time (15–48 percent)  
• More on-time arrivals                                             |

*Improvements observed across transportation solutions worldwide offered by IBM and other vendors.*

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The Shift to Smarter Transportation Management?

Harvests existing data and easily scales to local needs

- Optimize Total Lifecycle Cost of operating the transit infrastructure
- Improve safety and satisfaction of citizens

While delivering essential services with flexibility and efficiency

- Improve reputation of services
- Help make city or broader region more competitive

Traditional approach

- Decentralized management
- Disconnected systems, siloed stakeholders
- Citizens as users only
- Reactive to disruptions and events
- Custom solutions, hard to scale

Smarter approach

- Integrated, centralized management
- Common operating picture
- Citizens actively engaged
- Proactive intervention, real-time awareness
- Flexible industry platform, delivery models
Data Beyond the Transportation Management Center

City in Canada
Reduces Infrastructure Planning time from 6 months to 3 weeks and creates a more cost efficient plan which will save significant money in execution.
How does this work?

Applying Analytics to gain a deeper view into operations can provide a number of views and insights that can be applied to better support business activities.
Example: Bus Bunching

Review of historical data to forecast benefits of using Intelligent Operations over a 3-year planning horizon for a Metro Bus system.

Increase in Ridership
Predictive Analytics

Increase Operational Efficiencies
Integration & Collaboration

Cost Reduction
Process Automation

IBM Intelligent Transportation

3-year Revenue increase of
$2,486,000
## Impact of schedule optimization by eliminating delays

### Data Driven Insight

<table>
<thead>
<tr>
<th>Route</th>
<th>Direction</th>
<th>Mean Delay w.r.t scheduled run time</th>
<th>#Weekday Services</th>
<th>Weekday en-route delay cost</th>
</tr>
</thead>
<tbody>
<tr>
<td>108</td>
<td>Southbound</td>
<td>11.4</td>
<td>38</td>
<td>$911</td>
</tr>
<tr>
<td>108</td>
<td>Northbound</td>
<td>8.7</td>
<td>38</td>
<td>$699</td>
</tr>
<tr>
<td>112</td>
<td>Eastbound</td>
<td>13.4</td>
<td>88</td>
<td>$2,490</td>
</tr>
<tr>
<td>112</td>
<td>Westbound</td>
<td>13.5</td>
<td>87</td>
<td>$2,481</td>
</tr>
<tr>
<td>119</td>
<td>Southbound</td>
<td>15.0</td>
<td>94</td>
<td>$2,967</td>
</tr>
<tr>
<td>119</td>
<td>Northbound</td>
<td>11.1</td>
<td>89</td>
<td>$2,078</td>
</tr>
<tr>
<td>120</td>
<td>Southbound</td>
<td>15.6</td>
<td>71</td>
<td>$2,331</td>
</tr>
<tr>
<td>120</td>
<td>Northbound</td>
<td>15.9</td>
<td>69</td>
<td>$2,314</td>
</tr>
<tr>
<td><strong>Total</strong></td>
<td></td>
<td><strong>574</strong></td>
<td></td>
<td><strong>$16,271</strong></td>
</tr>
</tbody>
</table>

Optimizing the schedules to gain **only 10% improvement**, will save $1,600 for the above 4 routes per day which is an average of $400 per route per day.

**Annual Savings:**

4 routes:

52 weeks * 5 days a week * 4 routes * $400 = $416,000

100 routes:

52 weeks * 5 days a week * 100 routes * $400 = $10,400,000
Other cases leveraging intelligent transportation operations

**Da Nang, Vietnam**
Improves public transit network (100 City buses) with real-time information on traffic control center to assist in monitoring traffic and controlling traffic lights.

**Queensland Motorways**
Moves ¼ million vehicles a day.
Improves traffic flow through timely commuter advice and automated toll collection.

**Swedish Road Administration pilot**
Reduced traffic by 25% in the center of Stockholm and generated an estimated €50 Million in new revenue.

**Finnish Transport Agency**
Transforms 78,000 km of roadway data into insights to enhance safety and operational efficiency.
Closing Thoughts For Gains In Data Driven Success

• It is critical to get the right information to the right set of users at the right time, through visibility across networks.

• This can only be made possible by interactions between various government agencies at multiple levels (city, state, & country), non-governmental organizations, and other data sources

• Using data and analytics to drive change leverages your infrastructures and organizations rather than replacing them.

• New cloud technology can make these solutions more affordable. It open opportunities for shared resources across a city, county or state.
Thank you.
City of Zhenjiang, China, is transforming its public transportation system, and using analytics technology to manage bus services across the city.

**Improved**
in route-change execution for exceptionally delayed buses

**More rapid response**
to traffic jams and crowds, reducing wait times and helping ensure capacity

**Enhanced**
citizen safety, citizen satisfaction and energy efficiency

“*Working with IBM, we will make our public transportation system faster and more efficient while making our city a better place to live in.*”
—Mingnian Yin, director of reform commission, City of Zhenjiang

To bolster economic development, increase tourism and improve overall public welfare, the city initiated the “Smarter Zhenjiang, Smarter Tourism” project which includes plans to replace and upgrade more than 400 bus stations and over 1,000 public transportation vehicles.

In conjunction with the system-wide upgrade, Zhenjiang will rely on IBM’s Intelligent Transportation solution to provide city managers with a consolidated view of the transportation network, and initiate a new bus scheduling system that will use analytics technologies to manage traffic patterns and over 80 routes across the city.
Why IBM for smarter transportation management?

Scalable transportation platform designed to help:

- Get ahead of problems with the power of predictive analytics, analyze issues and improve continuously
- Eliminate silo-based problem solving by leveraging a system-wide view
- Employ a single view of truth and collaborative process driven problem solving for incident management
- Industry’s leading transportation semantic model in-built in the product
- Leverage current investments, incrementally add value and get the best total cost of ownership
- Leverage cross-domain synergies with other transportation modes, public safety, city planning, etc.
- Work with open industry standards, ecosystem of partners
Functionality for Traffic Operations

Smarter Cities Management Smarter Transportation Management

Manage Real-Time Traffic Events

Click to Action: Map and List Adapt Instantly to Selections

Roles & Permissions

Intelligent Transportation

Automatic Clustering Based on Map Zoom Level

View Service Level, Event, & Device Details

Define Custom Map Layers / Views

Real-Time and Historical Reporting

Predicted Traffic Conditions 60 Minutes Out

Historical Analysis & Planning

Real-Time and Historical Reporting

Define Custom Map Layers / Views

Predicted Traffic Conditions 60 Minutes Out

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Business capabilities city leaders need

Create
a safer and more-citizen-friendly transportation network

Build
smarter operations that can anticipate, adapt and solve

Drive
costs down and improve revenue and ridership
Intelligent Transportation – Smarter Traffic Operations

Transformative, centralized management of traffic operations built on advanced analytics and collaborative incident management

- Improve decision making: Gain real-time situational awareness about current traffic performance and issues
- Improve service to citizens: Minimize negative human and commercial impact of congestions and incidents through proactive decisions
- Lower cost of upgrade: Lower solution cost leveraging prior investments and expanding the technology/vendor options
- Improve coordination & control: Dashboards that integrates operational tools and optimizes workforce
- Implement auditable best practices: Implement auditable collaborative processes for flow optimization and incident management