Iowa DOT Emphasis areas for improvement:

- Communication
- Economics
- Safety
- Mobility
What is the role of a State DOT??

• Role of a DOT is changing and not all will embrace the Change

  A Fusion of information is happening around transportation - data, land use, telecommunication, vehicles, navigation, commerce, etc.

• DOTs will become source and facilitators of information and data.
• The Information (and Data!) is becoming as important if not more important than the Infrastructure.
Transport and Transportation Interaction

We transport products and people on the transportation system?

Do products transport off the transportation system as we define it?
   Pipeline? Fiber? Wire?

Merging all areas of Transport with Transportation is essential.

Interactions from pipeline to road/rail/water is more important than the percentage of trucks and gross volume of vehicles.

The interaction of what is being transported has a direct impact on the economics of transportation, of which, we do not account for....
Economics of **Iowa**

**Producer State** = $18 Billion exports

**Iowa Gross State Product** = $165 Billion

$1.1 billion - $2.5 billion Producers Spend on moving goods

84% of Iowa Exporters are Small to Medium-sized companies

"Freight is our competitive advantage."

95% of customers for Iowa products are outside the US
Iowa Project Industry Sectors and Breakdown

Strategic Approach to Economic Development

- **Attraction**
  - Supply chain development
  - Cluster development

- **Retention**
  - Expansion of Existing Industry
  - Growth through innovation

79.72% of all projects are existing industry.
Manufacturing Changes

Yesterday:
- Large Inventory on-hand
- Vertical Integration - internal parts and technology
- Sourcing from owned co-operations

Today:
- Limited Inventory on-hand
- Most manufacturers focus on few core competencies and product lines
- Most outsource stages of productions to suppliers (sometimes hundreds to thousands)
- Dense networks of manufacturers (small, medium, large) best
- Information networks critical component of production (high-end broadband connectivity)
Manufacturing Transportation

- Manufacturers spend ~60% of the final price of final product on purchase inputs.
  \(^*\)Economic and Statistics Administration 2012

- Distributed production networks for manufacturers need healthy physical supply chains to be competitive

- Total Cost of Ownership in purchasing decisions by manufacturers.
  Costs of acquisition, transportation, storage - shipping costs and time, storage costs, obsolescence of inventory, financing costs, risk of interruptions

  Business Continuity Institute's November 2013 report:
  - 75% of 500 businesses surveyed said they did not have full visibility of the supply chain.
  - 30% did not know where they fit into any of their suppliers' priorities.
Linking Transportation and Economics

Iowa Project Vision:
To effectively identify and prioritize investment opportunities for an optimized freight transportation network to lower transportation costs for Iowa businesses and promote business growth in Iowa.
PHYSICAL - 1-Products, 2-Sites, 3-Demand

BEHAVIORAL POLICIES - 4-Inventory, 5-Sourcing, 6-Transportation
Linking Transportation and Economics

**Supply Chain Network** - Suppliers, plants, warehouses, and flows of products from origin to the final customer. 80% of the landed costs are locked in with the location of the facilities.

**Supply Chain Network Design** - discipline to determine the optimal location and size of facilities and the flow through the facility network.

**Demand-Based Freight Transportation Network Optimization** - Applies supply chain network design and optimization techniques to freight transportation network.

- Traditional approach focuses on capacity planning
- Traditional methods do not quantify cost saving opportunities in a multimodal network
- Commodity Flow is more valuable than Volume of vehicles

Process leverages advanced algorithms (linear program) and tools developed in commercial supply chain network optimization and management.

Identifies opportunities to use lower cost transportation modes and additional infrastructure elements to enable lower cost options for Iowa DOT planning linked with IEDA Business Development.
Linking Transportation and Economics

Physical Supply Chain design on State of Iowa – DOT has developed a robust data base of all freight movement across all modes at the zip code level – meaning we have data on all freight movement from county to county (in/out Iowa and US) and county to foreign destination.

Allows us to provide value added (no cost) Supply Chain Design for any Iowa Company or Company interested in developing in Iowa (on-going).
Opportunities in Freight Flow

*2012 FAF 3.5, FHWA
Opportunities in Cost Savings

Statewide Weekly Costs by Mode: Baseline vs. Optimized

- Baseline Transportation Cost/Iowa Gross State Product = ~21%
- Optimized Transportation Cost/Iowa Gross State Product = ~14%
Network Optimization Approach

- Analysis of Freight Network Demand and Capacity: Analyze high priority demand and freight network capacity
- Performance Measurement and Constraints Analysis: Use quantitative and qualitative measurements, identify and prioritize current and forecasted performance constraints
- Creating and Prioritizing Optimization Strategies: Develop pragmatic optimization strategies, focuses on optimization strategies with high Return on Investment
- Business Case Development: Conduct financial analysis and develop financial models, develop actionable recommendations with justifications
Opportunity: Cross Docking
Opportunity: Cross Docking

- Evaluated total cost saving opportunity in four regions
- Region 1 has highest cost saving, but Region 2 & 3 are more viable due to existing access to interstate highways
- Selected Region 2 with concept to co-locate cross-dock and intermodal facilities

<table>
<thead>
<tr>
<th>Location</th>
<th>Total Annual Saving Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Region 1</td>
<td>$909 Million</td>
</tr>
<tr>
<td>Region 2</td>
<td>$883 Million</td>
</tr>
<tr>
<td>Region 3</td>
<td>$908 Million</td>
</tr>
<tr>
<td>Region 4</td>
<td>$713 Million</td>
</tr>
</tbody>
</table>
Cross-Dock Impact on Freight

Benefits:
- Leverage freight consolidation to reduce transportation costs
- Reduce long distance truck travel and improve sustainability
## Opportunity:
### High Volume Origin-Destination Pairs Containers

<table>
<thead>
<tr>
<th>Item</th>
<th>Opportunity</th>
</tr>
</thead>
<tbody>
<tr>
<td>Annual Gross Transportation Saving</td>
<td>$412 Million</td>
</tr>
<tr>
<td>Empty Container Reposition Cost</td>
<td>($123 Million)</td>
</tr>
<tr>
<td>Total Outbound Container Number</td>
<td>247,000</td>
</tr>
<tr>
<td>Total Inbound Container Number</td>
<td>42,000</td>
</tr>
<tr>
<td>Total Container Shortage</td>
<td>205,000</td>
</tr>
<tr>
<td>Annual Net Saving</td>
<td>$289 Million</td>
</tr>
<tr>
<td>Annual Lift Number</td>
<td>494,000</td>
</tr>
</tbody>
</table>
Opportunity: New Intermodal Facility

Current State

Future State

Benefits:
- Leverage rail network to reduce transportation costs
- Reduce truck traffic and improve sustainability
Iowa's Energy Production and Consumption

- Movement of Energy in US is shifting due increase of energy exports
- Global demand increasing - commodity/price fluctuations
- Iowa has an energy intensive economy
  - Iowa has no fossil fuel resource production
    - Iowa ranked 5th in energy use per person
    - Top energy-consuming sectors: agriculture, biofuels manufacturing, and transportation
    - High residential and agricultural use of LPG/propane - 3x national average

Proposed Project & Vision: Energy supply chain network design and optimization
- Analyze energy supply and demand in Iowa and surrounding regions to identify supply chain constraints
- Enhance existing database with energy movement, supply and demand data
- Develop and prioritize optimization strategies for an optimized energy needs, movements, and supply chain network in Iowa
- Recommend a strategy and create a business case on how to create an efficient energy movement to meet supply chain for Iowa businesses, business development linked with IEDA, and actions to prepare for future needs and risks.
Propane Supply Chain and Optimization

DOT and IEDA conducted a comprehensive analysis of propane

- Inventory Management Analysis
- Transportation Network Analysis
- Demand Scenarios & Risk Analysis
- Supply Alternatives

Recommendations:
Monitoring, Communication, Incentivize Behavior, Incentivize Infrastructure, Implement Data Strategy
Fusion of Transportation and Economics

- **Quantitative Analysis**
  - Cost, capacity, etc.
  - Economic viability

- **Qualitative Analysis**
  - Strategic alignment
  - Increasing freight network resiliency
  - Tax incentive / funding availability
  - Job creation and local buy-in
  - Service levels / transportation time
  - Road mile reduction
  - Project implementation risks

- Effectively identify and prioritize investment opportunities to lower transportation costs for businesses.
- Identify new infrastructure opportunities to optimize freight transportation network.
- Leverage current transportation opportunities to deliver optimized results.
Product
- The products that businesses deliver to their customers
- Product dimension, weight, and other physical characteristics

Transportation Demand
- The desire to ship products from origin to destination
- Includes the quantity of the products to be shipped, the mode of transportation, the value of the products, and any lead time or distance requirement

Transportation Network
- Highway, rail, and water network and capacity data

Manufacturing and Customer Location
- Includes the geographic location information of origin and destination points
- Includes facility capacity

Transportation Infrastructure Cost
- Includes the costs associated with construction and operation

Transportation Cost
- Includes all cost components associated with shipping a specific product from origin to destination
Quantitative Analysis
- Cost, capacity, etc.
- Economic viability

Qualitative Analysis
- Strategic alignment
- Increasing freight network resiliency
- Tax incentive / funding availability
- Job creation and local buy-in
- Service levels / transportation time
- Road mile reduction
- Project implementation risks
Effectively identify and prioritize investment opportunities to lower transportation costs for businesses
- Leverage current transportation network to deliver optimized results
- Identify new infrastructure opportunities to optimize freight transportation network

Identify economic development opportunities to recruit new companies to Iowa

Provide a foundation model to help existing Iowa businesses optimize their supply chains

Identify opportunities to improve network resiliency
Big Data and Transportation Safety
Big Data and Transportation Safety

Transportation Safety Forensic Analysis in Iowa in partnership with Big Data Company:

- Opportunity to re-look at years of crashes
- Iowa has 10 plus years of GIS loaded crash data
- Review with corresponding weather and crash circumstances
- Review with corresponding vehicle history information (including CMV)
- Review with driver record information (age, experience, license, etc.)
- Engineering issues
- Enforcement issues
- Similar location issues (location on road, etc.)
- Construction work zone and/or signage issues
- Indicators on driver education program adjustments and/or curriculum needs (DL, CDL, Motorcycle)
What is Next?

- High Quality Machine Ready Data
- Consistent structure for Data just like highway standards
- Be a Convener and Open data for Consumption and Possibilities