WORKSHOP ON FREIGHT MODAL COMPETITIVENESS

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Sudeshna Sen
Jolanda Prozzi
Chandra Bhat

Project 0-4013: Competitiveness of Alternative Transportation Modes

MAY 2004
Abstract:
In view of the study’s main objective — to understand and document those factors and policies that have a significant impact on freight modal shares — a freight Delphi expert survey was administered to supplement the freight literature. Nine freight experts representing various public and private stakeholders responded to an invitation to participate in a one-day Freight Modal Competitiveness Workshop on April 27, 2004. Workshop participants were asked to provide insight on: (1) future freight flows in Texas, (2) the relative importance of factors influencing the shippers’ mode choice, (3) anticipated logistic trends influencing freight flows, (4) policies aimed at operational improvements or infrastructure provision, (5) technological developments influencing modal competitiveness, and (6) the potential of legislative measures to facilitate a shift in mode utilization. This document includes the workshop material and results of the freight expert survey administered.

Keywords:
Mode competitiveness, freight mode choice, expert panel survey
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Workshop Participants .................................................................................................... 85
Dear Participant,

Over the past decades, freight traffic has been increasing faster than passenger traffic at a time when building additional road capacity has become more and more expensive and, in many cases, undesirable. Decision-makers have thus become increasingly concerned about the negative impacts (for example, hindering growth, traffic congestion, air quality, and environmental degradation) associated with the growing disparity between demand and capacity. In an effort to act proactively, the Texas Department of Transportation (TxDOT) is funding a research project to explore the competitiveness of alternative transportation modes. Specifically, the study’s main objective is to understand and document those factors and policies that have a significant impact on freight modal shares. The final outcome will be a decision-support system to assist the agency in planning for an efficient, balanced, and robust multi-modal transportation system for Texas.

In an effort to understand the changing dynamics of the freight system in Texas and the factors that impact mode choice, the Center for Transportation Research is organizing a one-day workshop to discuss various factors and policies that impact mode choice. I am writing to confirm your participation in this event as you have been identified as someone who can provide valuable insights into the dynamics of modal choice and the factors that impact freight modal utilization in the state of Texas.

The workshop will take the form of an interactive discussion forum and can be attended by invitation only. Participants will be asked to share their perspectives on the growth in freight flows in Texas over time and the anticipated freight trends that may impact freight mode share. Various factors identified from the literature as determinants of freight mode choice will be presented to participants, who will then be asked to add to these and rank the factors in terms of their impact on mode choice. The scoring will be done electronically using a real time voting system that guarantees the anonymity of each voter. Once the scores have been recorded, participants will be given the opportunity to discuss the outcome and revise their scores if necessary. During the latter half of the workshop, participants will be asked to assess the significance of different policies that relate to the identified factors. A similar process of scoring and discussion will be followed. Finally, the participants will be asked to discuss the likelihood of implementing the highest ranked policies being implemented in Texas.

Please do not hesitate to contact me (Tel no: 512-471-4535, Fax no: 512-475-8744, or Email: bhat@mail.utexas.edu) or Ms. Jolanda Prozzi (Tel no: 512-232-3079, Fax no: 512-232-3070, or Email: jjprozzi@mail.utexas.edu) if you have any suggestions, questions, or comments.
Your participation in this workshop is important to provide accurate and useful information to TxDOT. I look forward to your participation and contribution in the workshop.

Sincerely,

Dr. Chandra Bhat
Fluor Centennial Teaching Fellow in Engineering
Associate Professor and Associate Chairman for Administration and Planning
Workshop Agenda

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AGENDA
Workshop on Freight Modal Competitiveness

8:30  Breakfast

9:00 Welcome ......................................................................................Ron Hagquist

9:10 Project Objectives and Workshop Structure ............................Chandra Bhat

9:20 Freight Trends in the U.S. and Texas ............................................Michail Xyntarakis

  Demonstration: Voting Equipment (10 min.) .............................Jolanda Prozzi

  Expert Panel Voting: Future Freight Flows (10 min.)

  Discussion of Results and Re-voting (25 min.)

10:15 Coffee/Tea Break

10:30 Factors Influencing Mode Choice ............................................Michail Xyntarakis

  Expert Panel Voting: Freight Mode Choice (10 min.)

  Discussion of Results and Re-voting (25 min.)

11:15 U.S. Logistic Trends .................................................................Michail Xyntarakis

  Expert Panel Voting: Logistic Trends (10 min.)

  Discussion of Results and Re-voting (25 min.)

12:00 Lunch

12:30 U.S. Freight Infrastructure .......................................................Michail Xyntarakis

  Expert Panel Voting: Freight Infrastructure (10 min.)

  Discussion of Results and Re-voting (25 min.)

1:15 Technological Developments .....................................................Aswani Yeraguntla

  Expert Panel Voting: Technological Developments (10 min.)

  Discussion of Results and Re-voting (25 min.)

2:00 Coffee/Tea Break

2:15 Freight Legislation and Policy .....................................................Sudeshna Sen

  Expert Panel Voting: Freight Legislation and Policy (10 min.)

  Discussion of Results and Re-voting (25 min.)

3:00 Freight Mode Choice Scenarios
Directions from Austin Bergstrom International Airport to Center for Transportation Research

Exit AIRPORT toward TX 71
Turn LEFT (west) on TX-71 stay in right hand lane
Continue on TX-71 approx. 1.5 mi to US-183 NORTH
Exit RIGHT (north) US-183 NORTH approx 1.5 mi to AIRPORT BLVD/1ST - 5TH - 7TH STS
Exit RIGHT AIRPORT BLVD
Continue on AIRPORT BLVD approx. 2.4 mi
Turn LEFT (west) on MANOR RD approx. 0.9 mi
Continue on DEAN KEETON ST approx. 0.3 mi
DEAN KEETON ST becomes 26TH ST/DEAN KEETON ST
Turn right on RED RIVER ST approx. 0.3 mi
Arrive at CTR, 3208 RED RIVER ST
Workshop on Freight Modal Competitiveness

Workshop Presentation

- 
- 
-
Freight Modal Competitiveness

TxDOT Research Project
Research Director: Ron Hagquist
Research Supervisor: Chandra R. Bhat

Motivation

* Since 1970:
  - Population has increased 33%
  - VMT has increased 137%
  - Trunk VMT has increased 216%
  - System capacity has moderately increased (18% since 1980)

Project Objectives

1. To provide TxDOT with a forecasting methodology to anticipate changes in modal utilization for inter- and intra-urban passenger and freight movements in Texas; and
2. To translate this methodology into a practical decision-support capability to identify and evaluate the impact of policies aimed at ensuring an efficient, balanced, and robust multi-modal transportation system in Texas.

Survey Objectives

1. Assess the effect of various policies, technological developments, and legislative measures on mode shares
2. Assess the impacts of different scenarios on mode utilization
3. Evaluate the relative significance of various measures of mode competitiveness
4. Provide an estimate on future freight flows

Workshop Structure

1. Future freight flows
2. Factors influencing mode choice decisions
3. Assess the effect of policies/technological developments/legislative measures on mode utilization
4. Assess the impacts of different scenarios on mode utilization

How the voting system works

Question 1: To ensure a lasting and loving marriage it is suggested that in the case of an argument, if you are wrong “accept it” and if you are right “don’t mention it”?

<table>
<thead>
<tr>
<th>Strongly Disagree</th>
<th>Strongly Agree</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
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</table>

Strongly Disagree: A
Strongly Agree: E
Delphi Expert Panel Survey

TxDOT Research Project
Research Director: Ron Hagquist
Research Supervisor: Chandra R. Bhat

Section 1:
Future Freight Flows

Future Freight Flows
- Objective
- Past growth
- Question overview

Objective
Estimate a confidence interval in which future freight flows will most likely lie

Future Freight Flows
- Objective
- Past growth
  - Eno Foundation
  - National Transportation Statistics

Chart: Change in Ton-miles vs Tons (source: Eno Foundation)

Research Product 0-4013-P2
Future Freight Flows

Change in Domestic ton-miles by selected mode (source: National Transportation Statistics)

Air  Intercity Truck  Intercity Rail  Domestic Water  International Water

Index 1990=100

Future Freight Flows

**Objective**
- Forecasts used
- Question overview

US domestic
US international
Texas domestic
Texas international

Texas intercity truck
Texas intercity rail
Texas intercity water
Texas intercity air
Texas metropolitan areas

Future Freight Flows

**Question 1:** With what percentage will U.S. domestic freight ton-miles carried by all modes increase between now and 2015?

<table>
<thead>
<tr>
<th>Option</th>
<th>20%</th>
<th>20-30%</th>
<th>30-40%</th>
<th>40-50%</th>
<th>More than 50%</th>
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Future Freight Flows

**Question 2:** With what percentage will U.S. international freight ton-miles carried by all modes increase between now and 2015?

<table>
<thead>
<tr>
<th>Option</th>
<th>20%</th>
<th>20-30%</th>
<th>30-40%</th>
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Future Freight Flows

**Question 3:** With what percentage will domestic freight ton-miles - carried by all modes - with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Option</th>
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<th>20-30%</th>
<th>30-40%</th>
<th>40-50%</th>
<th>More than 50%</th>
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</tbody>
</table>
Future Freight Flows

Question 4: With what percentage will international freight ton-miles - carried by all modes - with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
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</thead>
<tbody>
<tr>
<td>20%</td>
<td>50%</td>
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<tr>
<td>A</td>
<td>E</td>
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</tbody>
</table>

Question 5: With what percentage will intercity truck ton-miles with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
</tr>
</thead>
<tbody>
<tr>
<td>45%</td>
<td>75%</td>
</tr>
<tr>
<td>A</td>
<td>E</td>
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</table>

Question 6: With what percentage will intercity rail ton-miles with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
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</thead>
<tbody>
<tr>
<td>40%</td>
<td>70%</td>
</tr>
<tr>
<td>A</td>
<td>E</td>
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</tbody>
</table>

Question 7: With what percentage will waterborne ton-miles with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
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</thead>
<tbody>
<tr>
<td>10%</td>
<td>40%</td>
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<tr>
<td>A</td>
<td>E</td>
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</tbody>
</table>

Question 8: With what percentage will airborne ton-miles with either an origin or destination in Texas increase between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
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</thead>
<tbody>
<tr>
<td>80%</td>
<td>110%</td>
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<tr>
<td>A</td>
<td>E</td>
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</tbody>
</table>

Question 9: With what percentage will metropolitan freight ton-miles increase in Texas between now and 2015?

<table>
<thead>
<tr>
<th>Less than</th>
<th>More than</th>
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<tbody>
<tr>
<td>30%</td>
<td>60%</td>
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<tr>
<td>A</td>
<td>E</td>
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</tbody>
</table>
Future Freight Flows

End of First Section

- Voting results
- Facilitated discussion
- Re-vote

Delphi Expert Panel Survey

End of Section 1

Section 2:
Factors Influencing Mode Choice
(Multi-criteria Measures of Mode Competitiveness)

Factors Influencing Mode Choice

- Objective
- Question overview

Determine the relative significance of various factors influencing mode choice decisions

<table>
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<tr>
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<th>Demand Related</th>
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<td>Distance</td>
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<tr>
<td>Flexibility</td>
<td>Provision of 3PL services</td>
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<tr>
<td>Reliability</td>
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<tr>
<td>Transit time</td>
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</tbody>
</table>
Factors Influencing Mode Choice

Question 1: How important will cost be to shippers when making mode choice decisions between now and 2015?

<table>
<thead>
<tr>
<th>Factors</th>
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<th>Extremely Significant</th>
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<tbody>
<tr>
<td>Cost</td>
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<td>Freight loss or damage</td>
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<tr>
<td>Reliability</td>
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Factors Influencing Mode Choice

Question 2: How important will web-enhanced EDI be to shippers when making mode choice decisions between now and 2015?

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<th>Factors</th>
<th>Extremely Insignificant</th>
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<td>EDI</td>
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<td>Reliability</td>
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Factors Influencing Mode Choice

Question 3: How important will freight loss or damage be to shippers when making mode choice decisions between now and 2015?

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<th>Factors</th>
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<td>Freight loss or damage</td>
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<td>Shipment value</td>
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<td>Reliability</td>
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Factors Influencing Mode Choice

Question 4: How important will flexibility be to shippers when making mode choice decisions between now and 2015?

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<td>Shipment value</td>
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<td>Reliability</td>
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Factors Influencing Mode Choice

Question 5: How important will reliability be to shippers when making mode choice decisions between now and 2015?

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<th>Factors</th>
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<tbody>
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<td>Distance</td>
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<td>D</td>
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<tr>
<td>Freight loss or damage</td>
<td>C</td>
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<tr>
<td>Reliability</td>
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</tbody>
</table>

Factors Influencing Mode Choice

Question 6: How important will transit time be to shippers when making mode choice decisions between now and 2015?

<table>
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<th>Extremely Significant</th>
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</thead>
<tbody>
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<tr>
<td>Distance</td>
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<td>D</td>
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<tr>
<td>Freight loss or damage</td>
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<td>Reliability</td>
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</tbody>
</table>
Factors Influencing Mode Choice

Question 7: How important will distance be to shippers when making mode choice decisions between now and 2015?

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<th>EDI</th>
<th>Freight loss or damage</th>
<th>Flexibility</th>
<th>Reliability</th>
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<th>JPL</th>
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<tbody>
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<td>C</td>
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</table>

Factors Influencing Mode Choice

Question 8: How important will shipment size be to shippers when making mode choice decisions between now and 2015?

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<th>EDI</th>
<th>Freight loss or damage</th>
<th>Flexibility</th>
<th>Reliability</th>
<th>Distance</th>
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<th>JPL</th>
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<td>D</td>
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Factors Influencing Mode Choice

Question 9: How important will shipment value be to shippers when making mode choice decisions between now and 2015?

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<th>EDI</th>
<th>Freight loss or damage</th>
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<th>Reliability</th>
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Factors Influencing Mode Choice

Question 10: How important will third party logistics services be to shippers when making mode choice decisions between now and 2015?

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<tr>
<th>Cost</th>
<th>EDI</th>
<th>Freight loss or damage</th>
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Factors Influencing Mode Choice

End of Second Section

- Voting results
- Facilitated discussion
- Re-vote

Delphi Expert Panel Survey

End of Section 2
Delphi Expert Panel Survey

Section 3: Logistic Trends

Logistic Trends

Objective

Question overview

Objective of this section

Question overview

Geographical concentration of production
Geographical concentration of inventory
Relocation of production/warehousing
Rescheduling of manufacturing and distribution processes
Concentration of trade through international gateways
Expansion of market area
Decline in real cost of transportation
Increase in inventory cost

Question 1: How significant will the geographical concentration of production be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant
A
Extremely Significant
E

Question 2: How significant will the geographical concentration of inventory be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant
A
Extremely Significant
E
Logistic Trends

Question 3: How significant will the relocation of production/warehousing be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E

Logistic Trends

Question 4: How significant will the rescheduling of manufacturing and distribution processes be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E

Logistic Trends

Question 5: How significant will the concentration of trade through international gateways be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E

Logistic Trends

Question 6: How significant will the expansion of market area be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E

Logistic Trends

Question 7: How significant will the declining in real cost of transportation be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E

Logistic Trends

Question 8: How significant will the increase in inventory cost be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant  Extremely Significant
A          B          C          D          E
Logistic Trends

Question 9: How significant will the Security be to freight traffic growth (all modes) between now and 2015?

Extremely Insignificant
A B C D E

Logistics Trends

End of Third Section

- Voting results
- Facilitated discussion
- Re-vote

Delphi Expert Panel Survey

End of Section 3

Infrastructure and Operations

- Objective
- Question overview

Characterize the impact of various policies related to operations or infrastructure provision on truck and rail mode competitiveness
Infrastructure and Operations

Objective of this section

Question overview
- Invest in highway bypasses around metropolitan areas
- Improve highway geometrics/modify design standards
- TransTexas Corridor
- Texas Truck system for rural areas

Question overview
- Lane restrictions for trucks
- Time of day restrictions for trucks
- Improved incident management
- ITS strategies to facilitate truck flow
- Improve connectivity to rail yards
- Establishment of rural rail districts

Question 1: How would you characterize the impact of providing highway bypasses around metropolitan areas on truck mode competitiveness between now and 2015?

Question 2: How would you characterize the impact of an improvement in highway geometrics or a modification of design standards on truck mode competitiveness between now and 2015?

Question 3: How would you characterize the impact of the TransTexas corridor on truck mode competitiveness between now and 2015?

Question 4: How would you characterize the impact of Texas truck system for rural areas on truck mode competitiveness between now and 2015?
Infrastructure and Operations

Question 5: How would you characterize the impact of lane restrictions on truck mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E

Infrastructure and Operations

Question 6: How would you characterize the impact of time of day restrictions on truck mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E

Infrastructure and Operations

Question 7: How would you characterize the impact of improved incident management on truck mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E

Infrastructure and Operations

Question 8: How would you characterize the impact of ITS strategies to facilitate truck flow on truck mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E

Infrastructure and Operations

Question 9: How would you characterize the impact of an improvement in the connectivity of rail yards on rail mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E

Infrastructure and Operations

Question 10: How would you characterize the impact of railroad districts on rail mode competitiveness between now and 2015?

Extremely Insignificant  Extremely Significant
A  B  C  D  E
Infrastructure and Operations

Question 11: How would you characterize the impact of the Trans Texas corridor on rail mode competitiveness between now and 2015?

A  B  C  D  E
Extremely Insignificant  Extremely Significant

Infrastructure and Operations

Question 12: How would you characterize the impact of rail bypasses on rail mode competitiveness between now and 2015?

A  B  C  D  E
Extremely Insignificant  Extremely Significant

Infrastructure and Operations

Question 13: How would you characterize the impact of ________ on rail mode competitiveness between now and 2015?

A  B  C  D  E
Extremely Insignificant  Extremely Significant

Infrastructure and Operations

End of fourth section

- Voting results
- Facilitated discussion
- Re-vote

Delphi Expert Panel Survey

Section 5: Technological developments

Technological developments

- Objective
- Technological developments overview
- Question overview
Technological developments

Objective of this section
Assess the impact of various technological developments on mode utilization

Truck Technologies
- Improved IC engines and emission systems
- Use of web-brokers
- Automated routing and vehicle scheduling

Rail Technologies
- New AC locomotives
- Innovations in the maintenance of tracks, locomotives and railcars
- Centralized computer-aided dispatching and control
- IT to enhance logistic integration

Technological developments Overview

Air Mode
- Larger and efficient aircrafts
- Improvements in air traffic control

Water Mode
- Mega container ships

Intermodal
- Improvements in cargo transfer facilities

Technological developments

Question 1: How would you characterize the impact of improved IC truck engine technologies on truck mode competitiveness between now and 2015?

- Extremely Insignificant
- Extremely Significant

A B C D E

Technological developments

Question 2: How would you characterize the impact of use of web-brokers on truck mode competitiveness between now and 2015?

- Extremely Insignificant
- Extremely Significant

A B C D E

Workshop on Freight Modal Competitiveness

Research Product 0-4013-P2
Technological developments

Question 3: How would you characterize the impact of automated routing and scheduling of trucks on truck mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E

Question 4: How would you characterize the impact of new AC locomotives that improve efficiency on rail mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E

Question 5: How would you characterize the impact of the innovations in the maintenance of tracks, locomotives and railcars on rail mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E

Question 6: How would you characterize the impact of centralized computer-aided dispatching and control of rails on rail mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E

Question 7: How would you characterize the impact of IT that enables logistic integration on rail mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E

Question 8: How would you characterize the impact of improvements in cargo transfer facilities on rail mode competitiveness between now and 2015?

Extremely Insignificant | Extremely Significant
A | B | C | D | E
Technological developments

Question 9: How would you characterize the impact of larger and efficient aircrafts on air mode competitiveness between now and 2015?

Extremely Insignificant
A       B            C       D       E

Extremely Significant

Question 10: How would you characterize the impact of improvements in air traffic control on air mode competitiveness between now and 2015?

Extremely Insignificant
A       B            C       D       E

Extremely Significant

Question 11: How would you characterize the impact of introduction of more and more mega container ships on water mode competitiveness between now and 2015?

Extremely Insignificant
A       B            C       D       E

Extremely Significant

Question 12: How would you characterize the impact of improvements in cargo transfer facilities on water mode competitiveness between now and 2015?

Extremely Insignificant
A       B            C       D       E

Extremely Significant

Technological developments

Question 13: How would you characterize the impact of ________________ on ______ mode competitiveness between now and 2015?

Extremely Insignificant
A       B            C       D       E

Extremely Significant

End of first round

- Voting results
- Facilitated discussion
- Re-vote
Delphi Expert Panel Survey

Section 6: Legislative Measures

**Objective**
Assess the impact of legislative measures on freight mode competitiveness

### Legislative Measures

- **Objective**

### Deregulations of 1980
- Motor Carrier Act
- Staggers Rail Act
- Airline Deregulation Act

### ISTEA 1991
- Vision for an intermodal system for freight

### Legislative Measures

- Funding for freight projects:
  - Increase in funding for CMAQ projects
  - Increase in funding for ITS projects
  - Innovative financing
    - TIFIA, Tax incentives

### Legislative Measures

- ISTEAA Reauthorization:
  - Driver hours of service regulation
  - Truck parking policy

- Environmental regulations:
  - Emissions control
    - Heavy truck engines
    - Rail locomotives
Legislative Measures

Other regulations:
- Security checks on HAZMAT truck drivers
- Changes in truck size and truck weight
- Increase in fuel tax
- Implementation of sales tax

Question 1: What would be the direction of mode shift if the CMAQ funding for highway projects is increased by 25%?

Significant shift towards rail
A  B  C  D  E

Significant shift towards truck

Question 2: What would be the direction of mode shift if the CMAQ funding for rail projects is increased by 25%?

Significant shift towards rail
A  B  C  D  E

Significant shift towards truck

Question 3: What would be the direction of mode shift if ITS funding results in an average trip travel time saving of 5% for trucks?

Significant shift towards rail
A  B  C  D  E

Significant shift towards truck

Question 4: What would be the direction of mode shift if rail connectivity to ports is financed through innovative state financing?

Significant shift towards rail
A  B  C  D  E

Significant shift towards truck

Question 5: What would be the direction of mode shift if the diesel fuel tax is increased by 10%?

Significant shift towards rail
A  B  C  D  E

Significant shift towards truck

# Legislative Measures

**Question 6:** What would be the direction of mode shift if the diesel fuel tax is increased by 10%?

<table>
<thead>
<tr>
<th>Significant shift towards air</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

**Question 7:** What would be the direction of mode shift if a sales tax of 8.25% on transportation is implemented?

<table>
<thead>
<tr>
<th>Significant shift towards rail</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

**Question 8:** What is the anticipated direction in mode shift given the 2004 driver hours of service regulation recently implemented?

<table>
<thead>
<tr>
<th>Significant shift towards rail</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

**Question 9:** What is the anticipated direction in mode shift given the 2004 driver hours of service regulation recently implemented?

<table>
<thead>
<tr>
<th>Significant shift towards rail</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

**Question 10:** What would be the direction of mode shift if public rest areas are privatized to provide for adequate truck parking facilities?

<table>
<thead>
<tr>
<th>Significant shift towards rail</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>

**Question 11:** What would be the direction of mode shift if stricter emission controls are required for heavy duty truck engines that result in 5% increase in operating cost?

<table>
<thead>
<tr>
<th>Significant shift towards rail</th>
<th>Significant shift towards truck</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>B</td>
</tr>
<tr>
<td>C</td>
<td>D</td>
</tr>
<tr>
<td>E</td>
<td></td>
</tr>
</tbody>
</table>
Legislative Measures

Question 12: What would be the direction of mode shift if stricter emission controls are required for rail locomotive engines that result in 5% increase in operating cost?

- Significant shift towards rail (A)
- Significant shift towards truck (E)

Question 13: What would be the direction of mode shift given increased security requirements on HAZMAT shipments in terms of the advanced provision of routing, driver, and shipment details?

- Significant shift towards rail (A)
- Significant shift towards truck (E)

Question 14: What would be the direction of mode shift if truck size and weight are increased to allow for trucks of 105000 lbs?

- Significant shift towards rail (A)
- Significant shift towards truck (E)

Delphi Expert Panel Survey

End of Section 6

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?
Scenario Evaluation

Objective

Policy overview

Assess the impact of “packages of measures” in diverting inter-city truck traffic to rail

Scenario Evaluation

Objective

Policy overview

The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility

Improve rail connectivity to freight terminals (eg. ports, airports, inland ports, and rail yards)

Increase the diesel fuel tax

Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.

Stricter requirements for emissions control from heavy duty diesel engines

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility

Extremely

Insignificant

A

B

C

D

E

Increase the diesel fuel tax

Extend the hours and availability of rail service to accommodate local market needs

Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.

Stricter requirements for emissions control from heavy duty diesel engines

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility

Extremely

Insignificant

A

B

C

D

E

Increase the diesel fuel tax

Extend the hours and availability of rail service to accommodate local market needs

Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.

Stricter requirements for emissions control from heavy duty diesel engines
### Scenario Evaluation

**Question:** How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

<table>
<thead>
<tr>
<th>Package</th>
<th>Effectiveness</th>
</tr>
</thead>
<tbody>
<tr>
<td>The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility</td>
<td>Extremely Significant</td>
</tr>
<tr>
<td>Improve rail connectivity to freight terminals (e.g., ports, airports, inland ports, and rail yards)</td>
<td>Extremely Insignificant</td>
</tr>
<tr>
<td>Increase the diesel fuel tax</td>
<td>Extremely Significant</td>
</tr>
<tr>
<td>Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.</td>
<td>Extremely Significant</td>
</tr>
<tr>
<td>Stricter requirements for emissions control from heavy duty diesel engines</td>
<td>Extremely Significant</td>
</tr>
</tbody>
</table>

---

**Research Product 0-4013-P2 32**
Scenario Evaluation

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

- The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility
- Increase the diesel fuel tax
- Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.
- Stricter requirements for emissions control from heavy duty diesel engines

Extremely Insignificant
A B C D E

Scenario Evaluation

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

- The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility
- Increase the diesel fuel tax
- Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.
- Stricter requirements for emissions control from heavy duty diesel engines

Extremely Insignificant
A B C D E

Scenario Evaluation

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

- The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility
- Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.
- Stricter requirements for emissions control from heavy duty diesel engines

Extremely Insignificant
A B C D E

Scenario Evaluation

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

- The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility
- Innovative state financing of smart transfer technologies to facilitate more efficient loading/unloading of freight trains.
- Stricter requirements for emissions control from heavy duty diesel engines

Extremely Insignificant
A B C D E
Scenario Evaluation

How effective will the following “packages of measures” be in diverting inter-city truck traffic to rail?

- Extremely
- Insignificant

A                       B                        C      D                        E

The rail infrastructure of the TTC is built, requiring a rail user fee to operate on the facility.

Stricter requirements for emissions control from heavy-duty diesel engines.

Expert Panel Survey

Thank You

Scenario Evaluation

End of first round

- Voting results
- Facilitated discussion
- Re-vote
Workshop Outcome

- 
- 
- 
- 

Workshop on Freight Modal Competitiveness

Research Product 0-4013-P2
Freight Trends in the U.S. and Texas
FREIGHT TRENDS IN THE U.S. AND TEXAS

Percentage Increase in Freight Flows between 2004 and 2015

- U.S. Domestic: 38%
- U.S. International: 45%
- Texas Domestic: 45%
- Texas International: 52%
- Texas Truck: 59%
- Texas Rail: 48%
- Texas Waterborne: 27%
- Texas Air: 93%
- Texas Metropolitan: 52%
Question 1: With what percentage will U.S. domestic freight ton-miles carried by all modes increase between now and 2015?

![Percentage Increase in U.S. Domestic Freight Flows, 2004-2015](image)

Question 2: With what percentage will U.S. international freight ton-miles carried by all modes increase between now and 2015?

![Percentage Increase in U.S. International Freight Flows, 2004-2015](image)
Question 3: With what percentage will domestic freight ton-miles - carried by all modes - with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase of Domestic Freight Flows with an Origin or a Destination in Texas, 2004-2015 (ton-miles)](image)

Question 4: With what percentage will international freight ton-miles - carried by all modes - with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase of International Freight Flows with an Origin or a Destination in Texas, 2004-2015 (ton-miles)](image)
Question 5: With what percentage will intercity truck ton-miles with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase in Intercity Truck Freight Flows with an Origin or Destination in Texas, 2004-2015 (ton-miles)](image)

Question 6: With what percentage will intercity rail ton-miles with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase in Intercity Rail Freight Flows with an Origin or Destination in Texas, 2004-2015 (ton-miles)](image)
Question 7: With what percentage will waterborne ton-miles with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase in Intercity Waterborne Freight Flows with an Origin or Destination in Texas, 2004-2015 (ton-miles)](chart)

Question 8: With what percentage will airborne ton-miles with either an origin or destination in Texas increase between now and 2015?

![Percentage Increase in Intercity Airborne Freight Flows with an Origin or Destination in Texas, 2004-2015 (ton-miles)](chart)
Question 9: With what percentage will metropolitan freight ton-miles increase in Texas between now and 2015?
Factors Influencing Mode Choice
**FACTORS INFLUENCING MODE CHOICE**

Scale: 1 – Extremely insignificant; 2 – Somewhat significant; 3 – Significant; 4 – Very significant; 5 – Extremely significant

<table>
<thead>
<tr>
<th>Factor</th>
<th>Significance</th>
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<tbody>
<tr>
<td>Reliability</td>
<td>4.56</td>
</tr>
<tr>
<td>Cost</td>
<td>4.33</td>
</tr>
<tr>
<td>Transit Time</td>
<td>4.33</td>
</tr>
<tr>
<td>Shipment value</td>
<td>4.22</td>
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<tr>
<td>Distance</td>
<td>3.78</td>
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<tr>
<td>Freight Loss or Damage</td>
<td>3.67</td>
</tr>
<tr>
<td>Flexibility</td>
<td>3.56</td>
</tr>
<tr>
<td>Shipment size</td>
<td>3.56</td>
</tr>
<tr>
<td>Electronic Data interchange</td>
<td>3.22</td>
</tr>
</tbody>
</table>
Question 1: How important will **cost** be to shippers when making mode choice decisions between now and 2015?

![Importance of Cost in Freight Mode Choice](image)

Question 2: How important will **web-enhanced EDI** be to shippers when making mode choice decisions between now and 2015?

![Importance of Electronic Data interchange in Freight Mode Choice](image)
Question 3: How important will freight loss or damage be to shippers when making mode choice decisions between now and 2015?

![Importance of Freight Loss or Damage in Freight Mode Choice](image)

Question 4: How important will flexibility be to shippers when making mode choice decisions between now and 2015?

![Importance of Flexibility in Freight Mode Choice](image)
Question 5: How important will reliability be to shippers when making mode choice decisions between now and 2015?

![Importance of Reliability in Freight Mode Choice](chart)

Question 6: How important will transit time be to shippers when making mode choice decisions between now and 2015?

![Importance of Transit Time in Freight Mode Choice](chart)
Question 7: How important will distance be to shippers when making mode choice decisions between now and 2015?

![Importance of Distance in Freight Mode Choice](chart)

Question 8: How important will shipment size be to shippers when making mode choice decisions between now and 2015?

![Importance of Shipment Size in Freight Mode Choice](chart)
Question 9: How important will shipment value be to shippers when making mode choice decisions between now and 2015?

![Importance of Shipment Value in Freight Mode Choice](image1)

Question 10: How important will third party logistics services be to shippers when making mode choice decisions between now and 2015?

![Importance of Providing of Third Party Logistics Services in Freight Mode Choice](image2)
U.S. Logistics Trends
U.S. LOGISTICS TRENDS

Scale: 1 – Extremely insignificant; 2 – Somewhat significant; 3 – Significant; 4 – Very significant; 5 – Extremely significant

<table>
<thead>
<tr>
<th>Factor</th>
<th>Significance</th>
</tr>
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<tbody>
<tr>
<td>Concentration of trade through international gateways</td>
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<tr>
<td>Geographical concentration of inventory</td>
<td>3.89</td>
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<tr>
<td>Expansion of market area</td>
<td>3.78</td>
</tr>
<tr>
<td>Increase in inventory cost</td>
<td>3.67</td>
</tr>
<tr>
<td>Concentration of production</td>
<td>3.56</td>
</tr>
<tr>
<td>Rescheduling of manufacturing or distribution processes</td>
<td>3.44</td>
</tr>
<tr>
<td>Relocation of production/warehousing</td>
<td>3.11</td>
</tr>
<tr>
<td>Decline in real cost of transportation</td>
<td>2.89</td>
</tr>
</tbody>
</table>
Question 1: How significant will the geographical concentration of production be to freight traffic growth (all modes) between now and 2015?

![Image of bar chart showing impact of geographic concentration of production on freight traffic growth]

Question 2: How significant will the geographical concentration of inventory be to freight traffic growth (all modes) between now and 2015?

![Image of bar chart showing impact of geographic concentration of inventory on freight traffic growth]
Question 3: How significant will the relocation of production/warehousing be to freight traffic growth (all modes) between now and 2015?

![Impact of the Relocation of Production/warehousing on Freight Traffic Growth (ton-miles)](chart)

Question 4: How significant will the rescheduling of manufacturing and distribution processes be to freight traffic growth (all modes) between now and 2015?

![Impact of the Rescheduling of Manufacturing and Distribution Processes on Freight Traffic Growth (ton-miles)](chart)
Question 5: How significant will the concentration of trade through international gateways be to freight traffic growth (all modes) between now and 2015?

Impact of the Concentration of Trade through International Gateways on Freight Traffic Growth (ton-miles)

Number of Votes

Extremely insignificant Somewhat significant Significant Very significant Extremely significant

First Round Second Round

Question 6: How significant will the expansion of market area be to freight traffic growth (all modes) between now and 2015?

Impact of the Expansion of Market Area on Freight Traffic Growth (ton-miles)

Number of Votes

Extremely insignificant Somewhat significant Significant Very significant Extremely significant

First Round Second Round
Question 7: How significant will the declining in real cost of transportation be to freight traffic growth (all modes) between now and 2015?

![Graph showing impact of a decline in real cost of transportation on freight traffic growth (ton-miles).](image)

Question 8: How significant will the increase in inventory cost be to freight traffic growth (all modes) between now and 2015?

![Graph showing impact of an increase in inventory cost on freight traffic growth (ton-miles).](image)
Question 9: How significant will the **Security** be to freight traffic growth (all modes) between now and 2015?

![Bar chart showing the impact of security to freight traffic growth between extremely insignificant and extremely significant.](image-url)
U.S. Freight Infrastructure
U.S. FREIGHT INFRASTRUCTURE

Scale: 1 – Extremely insignificant; 2 – Somewhat significant; 3 – Significant; 4 – Very significant; 5 – Extremely significant

Average ranking of policies that impact truck competitiveness

- Texas Trunk System for Rural Areas: 3.78
- Improved incident management: 3.56
- ITS strategies to facilitate truck flow: 3.56
- Invest in highway bypasses around metropolitan areas: 3.33
- TransTexas Corridor: 3.33
- Improve highway geometrics/modify design standards: 2.78
- Lane restrictions for trucks: 2.78
- Time of day restrictions for trucks: 2.56

Average ranking of policies that impact rail competitiveness

- Improved connectivity to rail yards: 3.78
- Railway bypasses: 3.33
- Establishment of rural rail districts: 2.78
- TransTexas Corridor on rail mode: 2.56
Question 1: How would you characterize the impact of providing highway bypasses around metropolitan areas on truck mode competitiveness between now and 2015?

Impact of Investment in Highway Bypasses around Metropolitan Areas on Truck Mode Competitiveness

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>First Round</th>
<th>Second Round</th>
</tr>
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<tbody>
<tr>
<td>Extremely insignificant</td>
<td>0</td>
<td>2</td>
</tr>
<tr>
<td>Somewhat significant</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Significant</td>
<td>1</td>
<td>2</td>
</tr>
<tr>
<td>Very significant</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Extremely significant</td>
<td>1</td>
<td>1</td>
</tr>
</tbody>
</table>

Question 2: How would you characterize the impact of an improvement in highway geometrics or a modification of design standards on truck mode competitiveness between now and 2015?

Impact of an Improvement in highway geometrics/design standards on Truck Mode Competitiveness

<table>
<thead>
<tr>
<th>Impact Level</th>
<th>First Round</th>
<th>Second Round</th>
</tr>
</thead>
<tbody>
<tr>
<td>Extremely insignificant</td>
<td>1</td>
<td>1</td>
</tr>
<tr>
<td>Somewhat significant</td>
<td>2</td>
<td>2</td>
</tr>
<tr>
<td>Significant</td>
<td>3</td>
<td>4</td>
</tr>
<tr>
<td>Very significant</td>
<td>0</td>
<td>1</td>
</tr>
<tr>
<td>Extremely significant</td>
<td>0</td>
<td>1</td>
</tr>
</tbody>
</table>
Question 3: How would you characterize the impact of the TransTexas corridor on truck mode competitiveness between now and 2015?

Impact of the TransTexas Corridor on Truck Mode Competitiveness

![Impact Chart]

Number of Votes

First Round ■ Second Round

Question 4: How would you characterize the impact of Texas truck system for rural areas on truck mode competitiveness between now and 2015?

Impact of the Texas Trunk System for Rural Areas on Truck Mode Competitiveness

![Impact Chart]

Number of Votes

First Round ■ Second Round
Question 5: How would you characterize the impact of lane restrictions on truck mode competitiveness between now and 2015?

Impact of Lane Restrictions for Trucks on Truck Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round | Second Round

---

Question 6: How would you characterize the impact of time of day restrictions on truck mode competitiveness between now and 2015?

Impact of Time of Day Restrictions for Trucks on Truck Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round | Second Round
Question 7: How would you characterize the impact of improved incident management on truck mode competitiveness between now and 2015?

![Impact of Improved Incident Management on Truck Mode Competitiveness](chart)

Question 8: How would you characterize the impact of ITS strategies to facilitate truck flow on truck mode competitiveness between now and 2015?

![Impact of ITS Strategies to Facilitate Truck Flow on Truck Mode Competitiveness](chart)
Question 9: How would you characterize the impact of an improvement in the connectivity of rail yards on rail mode competitiveness between now and 2015?

![Impact of Improved Connectivity to Rail Yards on Rail Mode Competitiveness](chart)

Question 10: How would you characterize the impact of railroad districts on rail mode competitiveness between now and 2015?

![Impact of the Establishment of Rural Railroad Districts on Rail Mode Competitiveness](chart)
Question 11: How would you characterize the impact of the Trans Texas corridor on rail mode competitiveness between now and 2015?

![Impact of the TransTexas Corridor on Rail Mode Competitiveness](chart1)

Question 12: How would you characterize the impact of rail bypasses on rail mode competitiveness between now and 2015?

![Impact of Railway Bypasses on Rail Mode Competitiveness](chart2)
Technological Developments
TECHNOLOGICAL DEVELOPMENTS

Scale: 1 – Extremely insignificant; 2 – Somewhat significant; 3 – Significant; 4 – Very significant; 5 – Extremely significant

Average ranking of technologies that impact truck competitiveness

- Automated routing and scheduling of trucks
- Improved IC truck engine technologies
- Use of web-brokers

Average ranking of technologies that impact rail mode competitiveness

- Improvements in cargo transfer facilities
- Innovations in the maintenance of tracks
- Centralized computer-aided dispatching and control
- IT to enhance logistic integration
- New AC locomotives
Average ranking of technologies that impact air mode competitiveness

0.00 0.50 1.00 1.50 2.00 2.50 3.00 3.50 4.00

Larger and more efficient aircrafts

Improvements in air traffic control

Average ranking of technologies that impact water mode competitiveness

3.75 3.8 3.85 3.9 3.95 4 4.05 4.1 4.15

Mega container ships

Improvements in cargo transfer facilities
Question 1: How would you characterize the impact of improved IC truck engine technologies on truck mode competitiveness between now and 2015?

![Impact of Improved IC Truck Engine Technologies on Truck Mode Competitiveness](chart1)

Question 2: How would you characterize the impact of use of web-brokers on truck mode competitiveness between now and 2015?

![Impact of the Use of Web-brokers on Truck Mode Competitiveness](chart2)
Question 3: How would you characterize the impact of automated routing and scheduling of trucks on truck mode competitiveness between now and 2015?

Impact of Automated Routing and Scheduling of Trucks on Truck Mode Competitiveness

Question 4: How would you characterize the impact of new AC locomotives that improve efficiency on rail mode competitiveness between now and 2015?

Impact of the New AC Locomotives on Rail Mode Competitiveness
Question 5: How would you characterize the impact of the innovations in the maintenance of tracks, locomotives and railcars on rail mode competitiveness between now and 2015?

Impact of Innovations in the Maintenance of Tracks on Rail Mode Competitiveness

![Graph showing the impact of innovations in the maintenance of tracks on rail mode competitiveness.]

Question 6: How would you characterize the impact of centralized computer-aided dispatching and control of rails on rail mode competitiveness between now and 2015?

Impact of Centralized Computer-aided Dispatching and Control on Rail Mode Competitiveness

![Graph showing the impact of centralized computer-aided dispatching and control of rails on rail mode competitiveness.]

Research Product 0-4013-P2
Question 7: How would you characterize the impact of IT that enables logistic integration on rail mode competitiveness between now and 2015?

Impact of IT that Enhances Logistic Integration on Rail Mode Competitiveness

Question 8: How would you characterize the impact of improvements in cargo transfer facilities on rail mode competitiveness between now and 2015?

Impact of Improvements in Cargo Transfer Facilities on Rail Mode Competitiveness
Question 9: How would you characterize the impact of larger and efficient aircrafts on air mode competitiveness between now and 2015?

Impact of the Introduction of Larger and more Efficient Aircrafts on Air Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round

Question 10: How would you characterize the impact of improvements in air traffic control on air mode competitiveness between now and 2015?

Impact of Improvements in Air Traffic Control on Air Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round
Question 11: How would you characterize the impact of introduction of more and more mega container ships on water mode competitiveness between now and 2015?

Impact of Mega Container Ships on Water Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round

Question 12: How would you characterize the impact of improvements in cargo transfer facilities on water mode competitiveness between now and 2015?

Impacts of Improvements in Cargo Transfer Facilities on Water Mode Competitiveness

Number of Votes

Extremely insignificant | Somewhat significant | Significant | Very significant | Extremely significant

First Round
Freight Legislation and Policy
FREIGHT LEGISLATION AND POLICY

Impact of legislative Measures (Rail vs Truck)

<table>
<thead>
<tr>
<th>Increase in truck size and weight</th>
<th>Increase in CMAQ funding for highway projects</th>
</tr>
</thead>
<tbody>
<tr>
<td>ITS funding resulting in trip travel time savings</td>
<td>Stricter emission controls on rail locomotive engines</td>
</tr>
<tr>
<td>Provision for adequate truck parking</td>
<td>Increase in CMAQ funding for rail projects</td>
</tr>
<tr>
<td>Implementation of 8.25% Sales tax on transportation</td>
<td>Driver hours of service regulation</td>
</tr>
<tr>
<td>Increase in Diesel fuel tax</td>
<td>Increased security requirements on hazmat shipments</td>
</tr>
<tr>
<td>Stricter emission controls on heavy duty truck engines</td>
<td>Rail connectivity to ports through innovative state financing</td>
</tr>
</tbody>
</table>

Impact of legislative Measures (Air vs Truck)

<table>
<thead>
<tr>
<th>Increase in Diesel fuel tax</th>
</tr>
</thead>
<tbody>
<tr>
<td>Driver hours of service regulation</td>
</tr>
</tbody>
</table>
Question 1: What would be the direction of mode shift if the CMAQ funding for highway projects is increased by 25%?

![Graph showing the distribution of responses to the question about mode shift in response to a 25% increase in CMAQ funding for highway projects.

Question 2: What would be the direction of mode shift if the CMAQ funding for rail projects is increased by 25%?

![Graph showing the distribution of responses to the question about mode shift in response to a 25% increase in CMAQ funding for rail projects.

Research Product 0-4013-P2
Question 3: What would be the direction of mode shift if ITS funding results in an average trip travel time saving of 5% for trucks?

![Graph showing the direction of mode shift for ITS funding results.]

Question 4: What would be the direction of mode shift if rail connectivity to ports is financed through innovative state financing?

![Graph showing the direction of mode shift for rail connectivity financing.]

Question 5: What would be the direction of mode shift if the diesel fuel tax is increased by 10%?

![Graph showing mode shift for Rail vs Truck]

Question 6: What would be the direction of mode shift if the diesel fuel tax is increased by 10%?

![Graph showing mode shift for Air vs Truck]
Question 7: What would be the direction of mode shift if a sales tax of 8.25% on transportation is implemented?

![Graph showing mode shift with votes]

Question 8: What is the anticipated direction in mode shift given the 2004 driver hours of service regulation recently implemented?

![Graph showing mode shift with votes]

Question 9: What is the anticipated direction in mode shift given the 2004 driver hours of service regulation recently implemented?

![Driver hours of service regulation (Air vs Truck)](chart)

Question 10: What would be the direction of mode shift if public rest areas are privatized to provide for adequate truck parking facilities?

![Public rest areas are privatized to provide for adequate truck parking facilities](chart)
Question 11: What would be the direction of mode shift if stricter emission controls are required for heavy duty truck engines that result in 5% increase in operating cost?

![Stricter emission controls on heavy duty truck engines](image)

Question 12: What would be the direction of mode shift if stricter emission controls are required for rail locomotive engines that result in 5% increase in operating cost?

![Stricter emission controls on rail locomotive engines](image)
Question 13: What would be the direction of mode shift given increased security requirements on HAZMAT shipments in terms of the advanced provision of routing, driver, and shipment details?

![Graph showing the direction of mode shift for increased security requirements on hazmat shipments]

- Significant Shift towards Rail: 4 votes
- Moderate shift towards Rail: 5 votes
- No impact on shares: 3 votes
- Moderate shift towards Truck: 2 votes
- Significant Shift towards Truck: 1 vote

Question 14: What would be the direction of mode shift if truck size and weight are increased to allow for trucks of 105,000 lbs?

![Graph showing the direction of mode shift for increased truck size and weight]

- Significant Shift towards Rail: 1 vote
- Moderate shift towards Rail: 1 vote
- No impact on shares: 5 votes
- Moderate shift towards Truck: 7 votes
- Significant Shift towards Truck: 7 votes

![First Round indicator]
Freight Mode Choice Scenarios
### FREIGHT MODE CHOICE SCENARIOS

Average ranking of policies influencing a shift from truck to rail  
(Scale: 0 = no impact, 1 = moderate shift towards rail, 2 = significant shift towards rail)

<table>
<thead>
<tr>
<th>Policy Description</th>
<th>Average Ranking</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rail TTC</td>
<td>0.625</td>
</tr>
<tr>
<td>Rail TTC &amp; Rail connectivity</td>
<td>1.125</td>
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<tr>
<td>Rail TTC &amp; Rail connectivity &amp; a diesel fuel tax</td>
<td>1</td>
</tr>
<tr>
<td>Rail TTC &amp; Rail connectivity &amp; a diesel fuel tax &amp; smart transfer technologies</td>
<td>1.25</td>
</tr>
<tr>
<td>Rail TTC &amp; Rail connectivity &amp; a diesel fuel tax &amp; stricter emissions control</td>
<td>0.75</td>
</tr>
<tr>
<td>Rail TTC &amp; Rail connectivity &amp; smart transfer technologies</td>
<td>0.875</td>
</tr>
<tr>
<td>Rail TTC &amp; Rail connectivity &amp; smart transfer technologies &amp; stricter emissions control</td>
<td>0.75</td>
</tr>
</tbody>
</table>
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•
•
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