A Combined Quantitative and Qualitative Approach to Planning for Improved Intermodal Connectivity at California Airports (TO5406-6406)

(Quarterly Meeting)
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Outline

• Objectives
• Project Status
• Mode Choice Model Implementation
• Bay Area Case Studies
• Guidelines for Project Evaluation
  – Measuring system performance
  – Measuring intermodal connectivity
• IAPT Demonstration
• Next Step
• Discussion
Objective

- Develop techniques for analyzing the effectiveness of alternative strategies for improving intermodal connectivity at airports using a combined quantitative and qualitative approach
  - Quantitative: Analytical models of airport traveler and transportation provider’s behavior, traffic networks
  - Qualitative: Descriptive case studies and analysis of agency decision making processes

- Research products:
  - Case studies of intermodal access projects at California airports
  - Develop prototype Intermodal Airport Ground Access Planning Tool (IAPT)
  - Using IAPT to evaluate selected case study projects at California airports
  - Policy recommendations and planning guidelines
Project Status – Progress on Current Tasks

- Develop prototype user interface module for the Intermodal Airport Ground Access Planning Tool.
  - Automatic data usage
  - Flexible parameter change using GUI
  - Full implementation of performance parameters

- Develop mode choice analysis module for the prototype Intermodal Airport Ground Access Planning Tool and calibrate on data for selected region
  - Development of mode choice models for OAK, SFO and SJC

- Implement transportation provider modeling in IAPT
  - Development of Nash Game approach
Project Status – Progress on Current Tasks

- Development of project planning guidelines
  - Use of quantitative analysis in project evaluation
  - Measuring system performance
  - Strategies for improving intermodal connectivity
  - Importance of interagency coordination
  - Institutional Issues

- Define Bay Area case studies
  - Validate IAPT from BART extension to SFO
  - Five proposed projects serving Bay Area airports
Mode Choice Model Implementation

- Current work in progress
  - Extension of IAPT to allow user-defined mode choice model structure
    - Currently limited to multinomial logit model
    - Need to be able to handle nested logit model with variable structure of nests
  - Refinement of model calibration datasets to improve model fit
    - Develop separate highway travel times for AM peak, PM peak and off-peak
    - Develop zonal estimates of shared-ride van fares and travel times
    - Resolve missing data in MTC transit network travel times
  - Analysis of rental car use
    - Rental car use accounts for about 50% of visitor business trips and 25% of visitor personal trips
    - Decision to use rental car depends on factors other than travel between airport and final trip end
    - Best handled outside framework of choice decisions for other modes
**Mode Choice Model Implementation**

- **Analysis of rental car use**

<table>
<thead>
<tr>
<th></th>
<th>Visitor Business</th>
<th>Visitor Personal</th>
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<tr>
<td>Rental car use (overall)</td>
<td>52%</td>
<td>26%</td>
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<td>Hotel trip origin</td>
<td>54%</td>
<td>47%</td>
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<td>Residence trip origin</td>
<td>53%</td>
<td>17%</td>
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<tr>
<td>Rental car use (San Francisco)</td>
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<td>Hotel trip origin</td>
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<td>42%</td>
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<tr>
<td>Residence trip origin</td>
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<td>13%</td>
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<tr>
<td>Rental car use (by trip duration)</td>
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<tr>
<td>3 days or less</td>
<td>55%</td>
<td>36%</td>
</tr>
<tr>
<td>4 days or more</td>
<td>49%</td>
<td>20%</td>
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Bay Area Case Studies

• **Objective of case study analysis**
  – Demonstrate application of IAPT to analyze potential projects to enhance intermodal connectivity at the three Bay Area airports
  – Validate the IAPT analysis results by comparing them to prior studies of case study projects using other analytical tools
  – Explore issues involved in enhancing intermodal connectivity and relative effectiveness of alternative strategies

• **Potential case studies**
  – BART extension to SFO (validation of IAPT)
  – Oakland Airport Connector
  – San Jose International Airport APM
  – Oyster Point ferry service
  – South Peninsula off-airport terminal
  – Santa Clara County off-airport terminal

• **Case study attributes**
  – Enhancement of existing services vs. introduction of new services
  – Range of technologies
  – Issues involved in modeling new modes
Bay Area Case Studies

• Extension of BART to San Francisco International Airport
  – Extension opened in 2003
  – Provides direct service to station adjacent to International Terminal
    • AirTrain automated people-mover connection to domestic terminals
  – Presents opportunity to validate predictive ability of IAPT
    • Calculate expected BART ridership based on 2001/2002 MTC Airline Passenger Survey data
    • Compare predicted ridership with actual station exit counts
    • Need to make adjustments for BART riders other than air passengers (airport employees, visitors)
• **Oakland airport connector**
  
  – Replacement of existing AirBART shuttle bus by an automated people-mover
  
  – Project currently being developed by BART in cooperation with the Port of Oakland
  
  – Case study analysis will explore impact of varying fare and frequency (waiting time) on use of BART for trips to Oakland International Airport
Potential Case Studies - 2

- **San Jose International Airport APM**
  - Replacement of VTA Airport Flyer bus service to VTA light rail station with automated people-mover link
  - Potential extension of system to Santa Clara Caltrain station
  - Case study analysis will explore effect of fare and service frequency on ridership and system economics
Potential Case Studies - 3

- **Oyster Point Ferry Terminal**
  - Provide fast ferry service to San Francisco International Airport from downtown San Francisco ferry terminal and East Bay
  - Ferry terminal currently under consideration by SF Bay Area Water Transit Authority
  - Proposed shuttle bus link to SFO
  - Explore role of entirely new mode for airport access trips
Potential Case Studies - 4

- **South Peninsula Off-airport Terminal**
  - Improve access from South Peninsula to Oakland International Airport
    - **Current transit access very time consuming or infrequent**
  - Express bus service via Dumbarton Bridge from terminal in vicinity of Palo Alto Caltrain station
  - Provision of low-cost long-term parking at off-airport terminal reduces vehicle trips and provides an affordable alternative to driving to airport
  - Potential for additional service to SFO and SJC
• Santa Clara County Off-airport Terminal
  - Provide express bus service to Oakland and San Francisco International Airports
    • Provide access to international flights at SFO and low-cost airlines at OAK
    • Existing rail transit service to OAK (Capital Corridor route) infrequent
    • Caltrain service to communities south of San Jose infrequent outside peak period
  - Potential location in vicinity of I-280 and SR 87 interchange
    • Good freeway access from communities to south and west of San Jose
    • Close to Convention Center and VTA light rail station
  - Opportunity for service to SJC and SFO in conjunction with South Peninsula off-airport terminal bus routes
Guidelines for Project Evaluation

• Objective
  – Provide guidance on the use of the IAPT for evaluating proposed projects to improve intermodal connectivity at airports
  – Address institutional issues that arise with planning and implementing airport ground transportation improvements

• Considerations in project evaluation
  – Project definition
  – Measures of performance
  – Project evaluation process
    • Use of the IAPT
  – Institutional aspects
Guidelines for Project Evaluation

• Project definition
  – Identify the extent of the ground access system to be evaluated
    • Decision makers
    • System users
    • Ground transportation providers and operators
    • Relevant surface transportation network
  – Identify and prioritize the main goals for the proposed project
    • Balance demand and capacity
    • Minimize passenger travel time and user costs
    • Minimize system travel time, vehicle-miles of travel, and costs
    • Minimize pollution and traffic congestion
    • Financial viability
  – Identify the set of attributes that defines the proposed project alternative
    • Service level: trip times, service frequency (wait time)
    • Fare
    • Access time
Guidelines for Project Evaluation

- Measuring system performance
  - Provider perspective
    - Number of passengers
    - Transportation provider revenue
    - Passengers/vehicle-mile and passengers/vehicle-hour.
  - Passenger perspective
    - Access time, wait time, in-vehicle travel time
    - Number of transfers
    - Direct cost
  - Government and Society
    - Vehicle trips
    - Total travel time
    - Vehicle-miles of travel (VMT)
    - Vehicle-hours of travel (VHT)
    - Vehicle emissions (E)
Guidelines for Project Evaluation

• Measuring system performance
  – System efficiency
    • Passenger/vehicle-hour (PVH)
    • Passenger/vehicle-mile (PVM)
  – Economic considerations
    • Revenue/passenger (RP)
Guidelines for Project Evaluation

- **Measure of connectivity performance**
  - Balance of interests of passenger and transportation provider
  - Proposed measurement: Connectivity Production Cost (CPC)
    - Passenger access time & waiting-time + #passenger transfer + on-board travel time + average combined vehicle-hour operating cost
    - All converted to dollar value for comparison
      - Transfer penalty per passenger
      - Travel time cost per passenger
      - Waiting time cost per passenger
      - Perceived cost for drop-off and pick-up
  - The larger the CPC value, the lesser is the connectivity quality
Guidelines for Project Evaluation

- **Measure of connectivity performance - challenging issues**
  - Current CPC measure only suitable for comparison within public transportation modes
    - Travel time components tend to favor using single-party direct modes (e.g. taxi, private vehicle) over HOV modes in intermodal comparisons
  - Calculating CPC per passenger may be better, but implementation challenges exist for some modes like shared-ride van
  - Requirement for measures that are sensitive to policy issues
    - Reflect airport user perceptions of relative attractiveness of each mode
    - Measure effectiveness of alternative policies and potential projects
  - Possible approach
    - Ratio of weighted travel time/cost by high-occupancy mode to private car
    - Can be applied at the system, service or zonal level
    - Weights based on coefficients of mode choice model – reflect perceived disutility of different travel time components relative to costs
Guidelines for Project Evaluation

- **Project evaluation process**
  - Alignment of project performance with project goals
  - Feasibility check
    - Physical
    - Financial
    - Long term vs. Short term
  - Review of goal priority
  - Identification and resolution of system performance issues
    - Sensitivity analysis
    - Trial-and-error
Guidelines for Project Evaluation

• **Institutional aspects**
  – Potential institutional issues in airport ground access
    • Failure to recognize the need for improvement in airport ground access
    • Lack of comprehensive interagency communications and coordination
    • Lack of consensus in setting overall objectives
  – Handling institutional issues at the regional and inter-regional levels
    • Airports should be actively involved in regional and state transportation planning.
    • Airport authorities need to proactively address intermodal access issues.
    • Better coordination methods should be implemented among planning agencies.
    • Integrating airport ground access planning into local and regional transportation system planning.
Guidelines for Project Evaluation

- **Institutional aspects**
  - Handling institutional issues at the project level
    - Coordination between airports and local government
    - Coordination between airports and transportation providers
    - Establish and maintain an integrated database for ground access planning
  1. Airport data
    - Airport landside operations and master plan studies
    - Air passenger and airport employee characteristics and ground access travel choices
    - Airline schedules and fares
    - Ground transportation service data
  2. Regional data
    - Transit network
    - Highway network
    - Regional demographics
IAPT Demonstration

- Automatic data usage
- Flexible parameter change using GUI
- Full implementation of performance measurement
- Case study test run: comparison between
  - AirBART Connector using bus
  - Oakland Airport Connector using BART
Next Steps

- IAPT implementation refinement
- Documentation for IAPT development
- Policy recommendations
- Workshop
- Final Report
Next Steps: Policy Recommendations

• Key policy issues in airport ground access
  – Funding intermodal connections
  – Promoting use of high-occupancy modes
  – Measuring and monitoring system performance
  – Role of airport ground access in regional transportation planning
  – Interregional (cities or counties) jurisdictional issues

• Project selection and implementation
  – Measuring cost-effectiveness of alternative projects and strategies
  – Contribution of proposed projects to regional transportation goals
  – Institutional roles and responsibilities
    • Caltrans, MPOs, transit agencies, airport authorities, FTA, FAA, FHWA