CRITICAL ISSUES FACING FREIGHT DATA COLLECTION AND ANALYSIS

Data Needs in the Changing World of Logistics & Freight Transportation

November 14, 2001
OVERVIEW

• Context
• Objective & Principles
• Issues
• Nature of Data Collected
• Approaches & Analysis Factors
• Urban Data Challenge
CONTEXT

• Transportation is an integral part of the goods and services production and distribution process
• The performance of the transportation infrastructure impacts location decisions and the competitiveness of firms, communities and nations
• The direction, tonnage and frequency of freight movements impact corridor occupancy and utilization, energy use, environmental emissions and citizen quality of life
• Government has an important role in freight movement facilitation and regulation
Supply Chain Management?
A Truck Dance?
A Convoy vary of Submarines?
Drivers eager to be surveyed?
The Border?
OBJECTIVE OF FREIGHT RESEARCH

• Better understand logistical relationships to:
  – Improve the competitiveness of firms and the geographic jurisdiction in which they are located
    • Global economy
      – Obtain information to assist industry and government
    • Addressing congestion/spur economic development
      – Long lead time to deliver infrastructure
  – Limit the nuisances of freight transport
    • Policy:
      – Dialogue with industry: safety/environment/efficiency
      – Government follows rather than leads/is reactive
    • Planning
      – Modelling/Land Use/Incident Planning
      – Targeting of Infrastructure Expenditures
DATA COLLECTION PRINCIPLES

• Data collection is not trivial in either financial or methodological terms
• Data collection programs must be preceded by a clear statement of needs
• The demand for data should not be an excuse for not knowing how to specify and solve problems with the hope that the answers will be revealed in the data
• Use of more variables will not necessarily lead to more accurate forecasts
• Must close the loop
  – Policy issues and objectives lead to a research process that will help determine planning strategies for improvement which in turn lead to implementation, refining those policies and objectives, and putting ideas into action
BASIC DATA ISSUES

• Purpose, quality/cost, comparability, collection
  – Freight information is largely single purpose in nature and not directly comparable by mode
  – Varying measures of activity: shipments, value, tonnage, movements, truckloads, tonne-kilometres, volumes, carloads, containers, cubic feet, TEU’s, load densities, on-time performance, per acre, per square feet
  – Diverse: major freight interchanges don’t dominate overall pattern
  – Issues re: survey information generally:
    • Data is proprietary and complex
    • Timeliness
    • Representative ness (response/sampling rate, under-reporting)
    • Cost of acquisition and analysis
BASIC DATA ISSUES

• Data is desirable but only if it is reliable
  – Truck drivers are not provided with sufficient documentation to answer some questions (e.g., commodity O/D)
  – Driver knowledge of geography poor
  – Biases can be introduced because of the requirements that detail be provided for some trips (e.g., international) but not all trips
  – Significant daily/weekly/seasonal variations because of production cycles: could impact survey design/data interpretation/model calibration

• What is the purpose of the information
  – Actual use or to verify other data collected
  – Are there limitations because of confidentiality issues (i.e., shipper/carrier or government policy/marketing) or geographic zone delineation
    • Address details may be collected but users of final data are only able to access county or FIPS level information

• Is the right person asking the right questions
  – Need consistent and appropriately trained data collection team
NATURE OF DATA COLLECTED

- Volume and Direction
- Commodity Value
- Weight (GVW, Commodity)
- Utilization
- Time (Hour, Day/Week)
- Truck Type & Body Style
- Establishment Type @ Trip End
- Trip O/D and Route Used
- Transportation Fleet
- Commodities
- Drivers
- Nature of Trip
- Registration & Jurisdiction
DATA APPROACHES

- Curiosity based versus mission oriented
- Top down/bottom up
- Focus on “big picture”, at borders and along corridors
- Emerging Decision Dictated
  - Most are too late to fit into complex data processing schedule
  - E.g., short term paving or imminent highway construction
DATA SOURCES

• Commodity input/output flows
• Customs (import/export)
• Surveys of firms (shippers/carriers) & drivers
  – Procurement/processing/distribution/disposal
  – Trip generation and attraction
  – The “why” of movement
• Screenline/weigh-in-motion counts (corridor/truck flows)
• ITS Opportunities
  – Proposed US legislation seen by Canadians in the business of collecting safety & regulation data as a big step (allows equipment monitoring by satellite)
DATA ANALYSIS FACTORS

• Nature of freight traffic
  – Where is it in the production and distribution process
  – Area wide versus route or link specific

• Mode choice factors
  – Cost, reliability, speed, tracking, damage protection or potential (rail vs truck for finished cars)

• Policy influences
  – Infrastructure provision, taxation, restrictions

• Choice of models:
  – Linear regression and gravity, auto-regressive integrated moving average, network price and equilibrium, aggregate and direct demand, disaggregate demand/behavioural choice, input-output, etc.
NEED FOR URBAN DATA

• Example of Toronto
  – Over 250 million truck movements annually in the GTA
  – Highway 401: 40,000 truck movements per day in Toronto
  – Profound increases in daily truck movements on urban highway network over the past few years (% increases greatly exceed auto growth)
  – Congestion and urban trucking movements are impeding inter-city movements on main highways
  – Unclear of impact of J-I-T and S-C-M logistic practices
  – Specific urban issues also need to be addressed
  – Last goods movement (truck) survey was done in 1986
  – “Port” activities form a small part of GTA goods activity
PROVINCIAL HIGHWAY TRUCK VOLUMES

14 9 Truck Volumes, 1993 (000's)
AN IMPORTANT PART OF THE FREIGHT PUZZLE:

The Urban Logistics Interface
URBAN ISSUES

• Keeping cities competitive and goods movement costs down, while enhancing the urban quality of life
  – Illegal curb side parking
  – Inadequate loading and receiving building bylaws
  – Truck route restrictions
  – Noise, safety, pollution, energy use
  – Congestion and load efficiencies resulting from smaller and more frequent movements
  – Where to locate inter-modal and truck terminals
  – Limiting competition between trucks and transit for the curb lane
  – Changing employment structure of cities and suburbs
    • Rejuvenating depressed industrial neighbourhoods
  – Building a dialogue with industry
  – “Through” traffic on major highways
URBAN DATA CHALLENGE

• Generating useful information for planners and engineers
  – Transportation models
  – Land use plans and bylaws
  – Emergency Response plans
  – Infrastructure priority staging (construction & repairs)
  – Traffic signalling
  – What can we learn from logistics industry

• Getting buy-in from industry
  – “What’s in it for me”
    • Productivity
    • Market share
  – shippers versus carriers versus drivers
  – ITS options

• Is the data worth the cost of acquisition?
  – What is the “value added”
  – What is the “problem” we’re trying to “solve”
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ONTARIO COMMERCIAL VEHICLE SURVEY

- 120 stations
- 45,000 interviews
- 100,000 daily truck trips
- $2 million cost
ONTARIO COMMERCIAL
VEHICLE SURVEY

• Inter-city truck sample over three months capturing longer-haul trip activity

• But:
  – Under-reports urban movements:
    • Placement of interview locations
    • Sheer volume of movements along corridors
    • Geographic extent and nature of service area
  – Only recently has CVS been able to generate enough information to input a traffic model with many urban zones (address level detail)
  – Doesn’t adequately account for courier industry presence
  – Doesn’t address the question “why” with respect to route use or delivery frequency
    • Important in the formulation of policy/route alternatives
PORTLAND COMMODITY FLOW STUDY APPROACH & ELEMENTS

• Commodity Scoping & Projection Refinement
  – Commodity Flow Survey, Reebie TranSearch, Oregon Freight Model, Journal of Commerce Reporting

• Collection of Truck Trip-End, Origin-Destination & Link Volume Data
  – Intermodal and reload facility focus

• Commodity Movement Logistics Survey

• Development of Tactical Model System for Commodity Movements
ISSUES RAISED IN INCORPORATING TRUCK TRIPS IN TRAVEL DEMAND FORECASTING MODELS

• Southern California Association of Government Model
  – Uses commodity flow forecasting and economic input-output modeling techniques
  – Generates and distributes truck trips to TAZ level
  – Applied data to truck weight classes and distribution warehouses

• Concerns
  – Spotty validation at cordon points for long-haul traffic where neighbouring metropolitan economies are integrated
  – Local distribution and service traffic poorly captured
  – Distribution and retail-to-consumer delivery movements
WHAT ISSUES NEED TO BE ADDRESSED TO PROVIDE ADEQUATE DATA & ANALYTICAL TOOLS TO SUPPORT FREIGHT FLOWS

• Why is the information needed
  – Does it answer the basic questions
  – Is a complete picture presented (size of cordon and modal competition)
• How often will it be collected
  – Logistics world is changing rapidly
• Who’s paying for it
• Which methods to acquire the data are being used
WHAT ISSUES NEED TO BE ADDRESSED TO PROVIDE ADEQUATE DATA & ANALYTICAL TOOLS TO SUPPORT FREIGHT FLOWS

• How do you address issues of confidentiality, data consistency and under-reporting
• Are the analytical tools robust enough
• Misleading appearances: are the statistics accurate/faulty and policy directions appropriate
• In Canada, government policy often addresses the short term (5 to 10 years max)
  – i.e., now eliminating lift axles
  – Harmonization of vehicle weights & dimensions which were once open game for truck builders to meet specific requirements
THE FUTURE FOR FREIGHT DATA COLLECTION AND ANALYSIS

Thursday November 15th Panel Discussion