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**Transportation, Globalization and Competitiveness:  
Transportation Data Needs for the Twenty-First Century**

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## **ABSTRACT**

At the dawn of the 21<sup>st</sup> Century, a variety of technological, economic, social, and institutional changes have converged to create a new freight transport sector, whose reach, functions, and modes of operation are significantly different from those of its recent counterpart. The emerging freight transport sector not only offers speedier goods transport at declining costs, increasingly, it provides its customers a number of valuable services such as global time-definite delivery, increasing speed and frequency, lean inventories, strategic outsourcing of the distribution function, flexibility of destination choices, etc. Such services add value to the operations of its customers, thereby, conferring strategic competitive advantages on customer U.S. firms operating in the global economy.

Since a major strategic objective of the U.S. Department of Transportation is the promotion of economic growth and development, the enabling of the U.S. firms to operate and compete in the global economy has policy interest. The Bureau of Transportation Statistics (BTS), as a modal administration and a national statistical agency, has a mission to develop the transport and related information and knowledge, necessary to support transport decisions that enhance American competitiveness.

This final and fourth report on the project, “Globalization, Transportation, and Competitiveness”, presents and outlines a three-part approach for BTS to acquire the information and knowledge to help it to support U.S. DOT’s strategic goal of promoting American economic growth and development.

This approach can be usefully conceived in three parts.

1. The first part, an actionable step which can build upon the work carried out in this project, involves planning and carrying out in the immediate future a survey that documents the interactive changes in the economy and the intermodal freight sector, so that one is able to arrive at a valid current picture of the scope, functions, and organization of the freight transport sector.

2. The second part of the approach will respectively analyze what implications these transformational changes in the freight transport sector pose for transport policy at the Federal, State, and local levels, and identify the transportation information requirements associated with the transport policies at various levels.
  
3. Develop a transportation information architecture (or framework), consistent with a Federal government role of promoting transport competitiveness in the global arena—by providing an informational ‘public good’, which can improve the overall efficiency of private transport companies and logistics providers, thereby enhancing the competitive advantage of the U.S. firms (both transport and non-transport).

# **Transportation, Globalization And Competitiveness: Transportation Data Needs for the Twenty-First Century**

## **I. INTRODUCTION AND OVERVIEW**

*“It isn’t they can’t see the solution,  
It is that they can’t see the problem”*

G. K. Chesterton

This document represents the fourth and final report prepared for the Bureau of Transportation Statistics (BTS) of the U.S. Department of Transportation on the research project entitled “Transportation, Globalization, and Competitiveness”.

The central argument of the earlier reports submitted to BTS on this project is that as U.S. firms compete in the global economy, there is emerging a new world of freight transport that is a vastly transformed landscape, with many elements of discontinuity and novel and profound changes from the past. Propelled by broad technical, social, and business factors which are greatly modifying the scope, and the structures, of the national and international businesses, the freight transport sector is being restructured and reinvented in recent years in ways that signal significant departures in its scope, functions, and organization (Chatterjee, 2000a, 2000b).

The many dimensions of the resulting transformation of the transport enterprise can be highlighted as follows:

- The advent of globalization and information technologies (IT) is modifying the freight transport sector in many ways. a) The combination of increasing information content and decreasing material intensity of many goods is changing the character of products which are being moved, and creating new distribution systems; b) The increasing use of IT by freight transport firms to regionally and globally ‘integrate’ goods supply chains, while maintaining lean inventories, is redefining the role of freight transport; and c) IT is

making possible novel management and control options for organizing the freight function itself. The transport-distribution system is thus evolving away from the earlier simpler shipper-carrier world with its emphasis on shipments and material flows. What is emerging is an integrated chain of economic actors that include a variety of logistics facilitators in the global supply chain besides carriers, producers, and consumers.

- Transportation companies are moving beyond their role as facilitating agents in the distribution channel for the manufacturing industry. Their focus is expanding beyond the traditional emphasis on cost reduction towards provision of services which add value and competitive advantages to their customers. Increasingly transport and distribution concerns are integrated into the strategic decisions of producers and shippers—where to locate their production and warehouse facilities, where to source their intermediate goods, how to manage their value chains such as using JIT systems, move into e-commerce, etc. Such an integration blurs the boundaries between shippers, carriers, and logistics service providers and vastly modifies the scope and nature of operations of the freight enterprises which are active in the national and international realms.
- The freight transport firm is playing an integral role in the value-adding chains of its customers—by assuring links between suppliers and producers at various stages in the chain under conditions of minimal inventories, and by playing a greater role in the final production stages helping to offer definite delivery times, flexibility of destination choice, and product presentation.

These new attributes of the evolving freight enterprises—a broader range of economic actors offering, in a lengthening supply chain, new dimensions of transport service (speed, time-definite delivery, flexibility, and agility), the increasing integration of transport into production functions, and the development of multi-organizational frameworks in freight logistics—signal the emergence of a freight sector whose scope, functions, and organization are significantly different from those of the traditional freight sector typically described in the transport literature. By contrast, an extensive literature in the business management and logistics documents this vast

transformation of the freight transport sector in the last decade and a half (see Chatterjee, 2000a, 2000b).

Given the pace of change and the declining half-lives of many new products, there are rapid changes in *what* types of commodities are moving, *from where to where*, and in *how* they are moving (reflecting the terms of service e.g. time-definiteness, frequency, speed, etc.). Since the ‘how’ (or service quality) of transport movements is crucial to the performance and productivity of the fast growth sectors in the global economy, there is a clear need to understand the emerging competitiveness-enhancing transport service dimensions.

Apart from a few exceptions (e.g., FHWA, 1998; TRB, 1999; OECD, 1996), transport analysts have, however, devoted little, if any, attention to characterizing the emerging freight transport world. Further, in the literature reviewed for this report, little effort is evident for the *subsequent* important step of exploring the implications of the transformed intermodal transport sector for transport policy or for gathering information necessary to support transport policies. Given the competitive advantages conferred by the rapidly evolving transport and logistics sector on the U.S. firms in the global economy, prudence would suggest that we develop systematic knowledge about the on-going transformations and their implications for policy.

A major objective of the U.S. Department of Transportation is to identify and implement transport policies which support the strategic goal of promoting the U.S. economic growth and development. The process of developing such policies is clearly dependent, as a first step, on a delineation and understanding of the diverse dimensions of the evolving transport logistics sector. Since this sector not only lowers costs in the economy but more importantly (due its knowledge-intensity and speed) adds both nationally and globally to production value and system-wide revenue and income, there is clear further interest in identifying both an appropriate transport policy set which will support the transport sector’s contribution to the U.S. economy, and the type of transport information necessary to support the policy development and applications.

The objective of this report is to present this three-part information needs' approach to BTS. Specifically, the three tasks are:

1. **A comprehensive survey of the emerging transport freight sector**—including the diverse actors, private and public, in the multimodal global supply chain; their attributes such as size, location, transport assets, information assets, their use of IT, modal and intermodal use patterns, levels of use, and problems in the use, of transport infrastructure, new operational characteristics of key ports and terminals, the range of transport service characteristics, barriers to efficient cross-border goods flow deriving from residual trade and transport regulation policies, incomplete economic liberalization, and from unreformed customs and other inspections, and regulation of physical attributes of cross-border freight vehicles, etc. The outcome of this step will be a systematic counting, assessment, interpretation, and documentation of the emerging service qualities of the freight transport sector.
2. **A Systemic Assessment of Transportation Decision Information Requirements appropriate to the Emerging Freight Sector** -- In the context of increasing regional and global trade and transport integration, the scope of U.S. transport policy has been expanding in recent years from its traditional focus on infrastructure investments and locations. Additional policy issues that have emerged relate to maintaining modal competition, promoting of intermodality, reducing of economic, institutional, and physical barriers to cross-border goods flow, incentives for economic growth at state and local levels, etc. Clearly, today's world is a richer and more diverse transport policy environment than the one that was evident a decade ago when TRB's 'Data for Decisions' was prepared. In what ways would the information agenda of BTS expand in the light of the recent changes: e.g. changes in the functions and organization of the freight sector, new policies at USDOT and elsewhere which influence the efficiency of freight transport services, the deployment of Intelligent Transportation Systems (ITS), and new governmental innovations such as performance indicators and 'Benchmarking in Transportation'. Such an assessment is, in the author's view, potentially a key strategic investment for BTS, as it reinvents itself and updates its agenda in a fast changing world.

3. **Transport Information Architecture: Toward a Transport Information Superhighway?** -- As the benefits of sharing transport information are being realized in the inter-organizational framework of transport and non-transport firms in the global supply chain, awareness of further potential benefits to the distribution chain and indeed the entire economy from increasing information-sharing is growing. However, the exploding data system in the inter-enterprise freight system lacks consistent architecture, standardization of data units, etc. A federal role—not a data collection or storage role but an information organization and standard setting role-- focusing on Metadata and Data Warehousing issues is potentially a ‘public good’ that can enhance the optimal use of the transport infrastructure and confer increasing competitive advantages to the U.S. (transport and non-transport) firms. A best-case scenario could be the emergence of a ‘Transport Information Superhighway’ modeled on the highly successful Information Superhighway.

Sections II, III, and IV of this report elaborate on these three information acquisition activities, in each case developing a rationale for the information sought, the types of information needed, and the delineation of the scope of the activities.

It should be noted that what this report attempts here is an outline of the scope and dimensions of the transportation information requirements that BTS could seek in each step. Our study of the emerging world of freight transport in the global economy suggest these information requirements, if BTS is to pursue its missions to support effective transport decision-making in the public and private sectors. Where possible, the actionable steps are identified. Further, resources will be needed to elaborate and develop in detail some of the data acquisition proposals made here. Part of the information requirements will be therefore derived from the interactive relationships between the private and public sector actors in the global freight chains. This aspect will be evident in the types of information needed in each step, in particular in the survey effort proposed in the next section.

In the first step which calls for a survey of the emerging freight transport sector, the scope of the survey is identified in terms of a) the types of actors to be surveyed, b) the major critical dimensions of freight transport to be monitored, and specific attributes in each dimension, c) The actionable next steps to prepare the survey document and implement it, in close concert with BTS staff, are identified.

The information programs presented in Sections III and IV are novel, large and complex. This report presents the rationale for each program and outlines the ideas that constitute the information concept and program. Steps to further elaborate and document these concepts to a form when they can be assessed by a wide group relevant experts, policy groups and stakeholders are presented.

## **II. COUNTING THE EMERGING FREIGHT TRANSPORT SECTOR**

### **Rationale for Counting**

This section highlights available evidence on crucial on-going changes in the freight transport sector, which is evolving in its character, functions, and organization in the context of a competitive global economy. The rationale for this synopsis is that, since the transport sector is embedded in the global economy, documenting and understanding the emerging transport and logistics sector are vital for developing policies which will enhance the competitiveness of the U.S. firms in the rapidly evolving marketplace.

As noted earlier, a variety of technical, social, and business factors have converged in the last decade or two to create a globally organized production system (for an increasing number of economic sectors), in the process transforming the transport enterprise broadly conceived (Figure 1).

Innovations in the complementary technologies of transportation and information have led to dramatic reductions in transport costs and sharp increases in service quality (speed, time-definite delivery, high frequency, etc.). This combination of lower costs and higher quality

transport service has made globalization physically possible. Globalization, deriving from firms' worldwide search for cheaper and better materials and production components for product assembly and global marketing, represents the cross-national functional integration and coordination of economic activities spatially dispersed over the globe.

Further, recent changes in public policies of many countries related to trade and transport have contributed also to the development of globalization. Thus free trade regimes (through GATT, WTO, etc) and liberalization policies promoted by the U.S. have led to enormous expansion of international trade and capital flows in the form of foreign direct investment (FDI) in production facilities not only in North America, Europe, and Japan, but also in many countries in Asia and Latin America. As production and consumption technologies evolve, value increasingly derives from knowledge; materials, production, services, and transportation are becoming more knowledge-intensive in an increasingly competitive network economy.