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network approach at Norfolk Southern Corp. is presented.

The conclusions are that the network approach offers significant advantages over the distance table approach. The advantages include greater consistency in distance calculation, flexibility in application, and ease of maintenance. The network approach has a greater programming complexity.

Norfolk Southern implemented a distance calculation module for its Revenue Waybill Accounting Systems that determines distances with consideration of four commodity/traffic class groupings and the time period during which service was provided. The module is now integrated into the monthly processing performed by the Revenue Waybill Accounting Systems. For processing of approximately 300,000 waybills, this module consumes approximately four CPU minutes on an IBM 3090-class mainframe computer. This implementation has established that the greater complexity of the network approach need not be an obstacle to capturing its benefits.

- *Improving Railroad Car Distribution Performance: Another Look*
  by Carl D. Martland, Massachusetts Institute of Technology

Car distribution performance has been affected much more by structural and technological change in the industry than by efforts aimed directly at car distribution technique. Improved rules and institutional arrangements have also worked well, as demonstrated in the Clearinghouse and the Multi-Level projects. The opposite is also true, as demonstrated by the experience with incentive per diem: poor rules lead to poor performance. For general service equipment, the most significant factor has been the tremendous surplus that was created at the end of the 1970s. For bulk commodities which typically result in 100% empty return, car utilization benefits have come through the increased use of larger cars and unit trains. For intermodal transportation, substantial changes have come about through terminal consolidation, the development of double-stack technology, and attention to the problem of filling backhauls. Substantial improvements in car distribution performance have come about through the centralization of planning and control made possible by the ability to collect, store, access and analyze huge amounts of data concerning shipments, freight cars, and train schedules. Lesser improvements have been achieved through the use of advanced optimization techniques. A particular problem has been the difficulty of matching such techniques to the complex control systems that have been developed by transportation companies.

- *Economies of Scale in Postal Operations: Evidence From An International Comparison,*
  by Joseph Harr, University of Maryland

Transportation and Rural Economic Development In America: Future Research Challenges

Session Organizer and Moderator: Frank Dooley, Upper Great Plains Transportation Institute

Summary by Session Moderator

Local and regional economies in rural America have suffered since the early 1980s as a result of the farm crisis, drought, and the decline in domestic energy production. Towns and cities in rural regions have sought to diversify their economies by attracting new industries. A poor understanding of transportation service and pricing alternatives may be a factor hindering economic development in rural areas.

Previous research suggests that transportation marketing and infrastructure factors can play an important role in local economic development. The major research problem is that little is understood about the working relationship between transportation and rural economic development.

Hough discussed variables that should be included in an analysis of transportation and

rural economic development. Her literature review searched five areas related to transportation, the economy, economic development, rural economic development, logistics, and highway investment.

Babcock began by outlining how transportation might affect rural economic development. He then proposed several models that could be used to analyze the issues. They include a production function model, a growth location model, an interregional competition model, an import substitution model, and an export expansion model.

Armbruster expanded the discussion, pointing out that other issues, such as entrepreneurship, tourism, etc., must also be considered. He also provided a classification scheme for types of investment in rural America.

Q & A Discussion

1. How important is transportation to the rural economy?
2. Does transportation contribute to the growth of a rural region?
3. Should the definition of transportation be broadened to include communications?
4. What is the relationship between transportation, economic development, and other aspects of rural life, including health care, water, labor, tourism?
5. Does the work in this area encompass problems on Native American reservations?

A general conclusion was that any work in this area must be conducted by integrated research teams from a systems perspective. Thus, the message to researchers is we must define ways to work together. The Agricultural and Rural Transportation Cluster will include a dialogue on these issues in future issues of their newsletter.

Panelists:

- Frank Dooley
  Upper Great Plains Transp. Institute
- Walter J. Armbruster
  Farm Foundation
- Michael W. Babcock
  Kansas State University
- Jill Hough
  Upper Great Plains Transp. Institute

Effects of Partial Rail Deregulation

Session Moderator: Michael Smith, Burlington Northern

- *Labor Productivity Returns to the Personnel Budget for Class I Railroads Under Deregulation*
  by Tenpao Lee, Joel Rudin and Karen Eastwood,
  Niagara University

One of the major reasons that the railroad industry has been financially depressed is due to the inefficiency of labor productivity. It is generally believed that well-conducted personnel management should increase labor productivity in the railroad industry. Hence, personnel department budgets should be treated as investments rather than expenditures.

The purpose of this paper is to evaluate the impact of the personnel budget on railroad labor productivity under deregulation. A Cobb-Douglas production function was estimated based on nine Class I railroads from 1983 to 1988 (a pooled time-series and cross-sectional data set). Four econometric models with alternative assumptions regarding the disturbance term, including the ordinary least square (OLS) model, the dummy variable model, the error component model, and the pooled time-series and cross-sectional model, were applied to deal with problems of autoregression and heteroscedasticity.

The results of four econometric models were generally consistent and suggest 1) a positive effect on railroad labor productivity for increases in the railroad personnel budget under deregulation; and 2) the consistently more productive railroads consistently had greater personnel budgets under deregulation. Hence, an overall shift in company values towards a greater emphasis on motivating, rewarding, selecting, and training employees, with a concomitant increase in the personnel budget, may entail productivity rewards for railroads. Policy implications and suggestions for future research were drawn and discussed.