PROCEEDINGS —
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Theme:
"Beyond The Bicentennial:
The Transportation Challenge"

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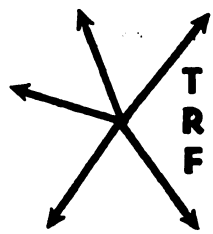

TRANSPORTATION RESEARCH FORUM

MANAGEMENT DECISION making in the marketing of freight transportation services requires accurate systems for measuring or predicting the costs and contribution to profit of individual segments of traffic. Comprehensive cost/profit analysis systems have been developed in the motor carrier and railroad industries. These systems can be used to determine profit contribution of individual customers, commodities, or traffic lanes. It is possible to describe the design of such systems in a manner which is applicable to both railroads and motor carriers, and also to other modes of transportation. This paper describes the general design of comprehensive cost/profit analysis systems in nonmodal terms, and then it shows how that design has been applied to rail and truck modes and might be applied to air and water. The following subjects are discussed:

- Management needs for information.
- Historical development of costing techniques.
- Impact of third generation computers.
- System design criteria.
- General system design.
- Applications.

Profit oriented management of a transportation company requires accurate, detailed cost and profit information. This information is needed especially for developing marketing strategies and directing sales effort. It is also important for service and equipment planning and operations decision making.

Traditional costing techniques have not adequately met the information needs of management. Some of the most commonly used costing methods in transportation were designed primarily for regulatory purposes. They use allocation methods which may be useful on a regional basis but are not sensitive to the differing characteristics of individual segments of traffic.

By its very nature, transportation as a business involves a huge number of individual products. Each origin-destination and commodity group combination may need to be considered as a separate product. As a result, accurate cost and profit analysis has massive data manipulation requirements even for small to medium sized carriers. Thus, the costing for management purposes has generally used statistical formulae for allocation of costs to small samples of total traffic.

The advent of third generation computer systems has brought about a basic change in capability for processing the volume of data needed for good management cost and profit information. It is no longer essential to be as dependent as before on statistical formulae when the computer can be used to maintain detailed expense and statistical data on individual operations. Similarly, it is now possible to apply costs to all shipments rather than relying on samples.

Some carriers have taken full advantage of new computer capabilities, but most have not. To design a comprehensive cost/profit analysis system the first time is a large undertaking. To apply an existing design to another carrier is not nearly as difficult if the general system principles are fully understood. The following paragraphs set forth these general principles and show how they have been applied in several systems now in use by carriers.

The general cost/profit analysis system described here is designed to receive input directly from daily operations and management expense and revenue accounting data. It is responsive to the following general criteria:

- Input data on individual vehicle movements is received from operations control systems.
- Expense data are provided by a management accounting system which corresponds to actual operations.
- Revenue data are received directly from either manual or computerized billing systems.
- The cost formula is designed to permit levels of aggregation and variability appropriate to different kinds of management decisions.
- Output necessary to evaluate management decisions is received in an appropriate time frame.

The general system design is illustrated in Exhibit 1. The processing cycle begins with the accumulation of activity data on individual vehicles. These data are used for developing operating statistics for periodic updating of unit costs. Simultaneously, they are used to develop vehicle movement cycles, both loaded and empty. Expense data are accumulated for time periods and cost centers related to operations. Revenue data are accumulated in a manner which maintains vehicle identification.

Unit costs are developed from operating statistics and expense data for time periods long enough to avoid distortion from short term fluctuations, but short enough to be sensitive to current changes in cost levels. These unit costs are then applied to vehicle cycle records for reporting periods as desired by management. This method enables assignment of costs for empty movement which are actually related to each loaded vehicle movement.

Revenue data from the waybill or freight billing system are then matched with costed vehicle trip records, pulling

Cost/Profit Measurement Systems For Transportation Management Decisions

*by Malcolm O. Laughlin**

together all cost and revenue data associated with each loaded movement. The result of this process is a data base of cost/profit information. This data base is easily manipulated to develop profit contribution by customer, commodity, or route segment.

There are several transportation companies which are now using the type of system described above. The first in the railroad industry was the Illinois Central's Cost/Profit Calculator. This system was designed not only to develop historical costs, but also to use stratified samples of past movements to project the profitability of future traffic.

A similar system was implemented by Finnish State Railways. This system takes data directly from computer systems for management accounting, operations statistics, revenue accounting, and wagon movement. The St. Louis-San Francisco Railroad also has this kind of system.

In the motor carrier industry, the concept was applied to an irregular route truckload carrier of milk and other edible liquid commodities. This system was designed to synthesize the profit contribution of a proposed itinerary by adding together historical contribution or cost data from individual segments. The same concept has also been applied to a large LTL carrier, assigning truck costs to shipments in a manner closely analogous to that used for assigning train costs to carloads.

**Vice President, PRC Railway Systems.*

GENERAL TRANSPORTATION COST/PROFIT MODEL
SYSTEM FLOWCHART

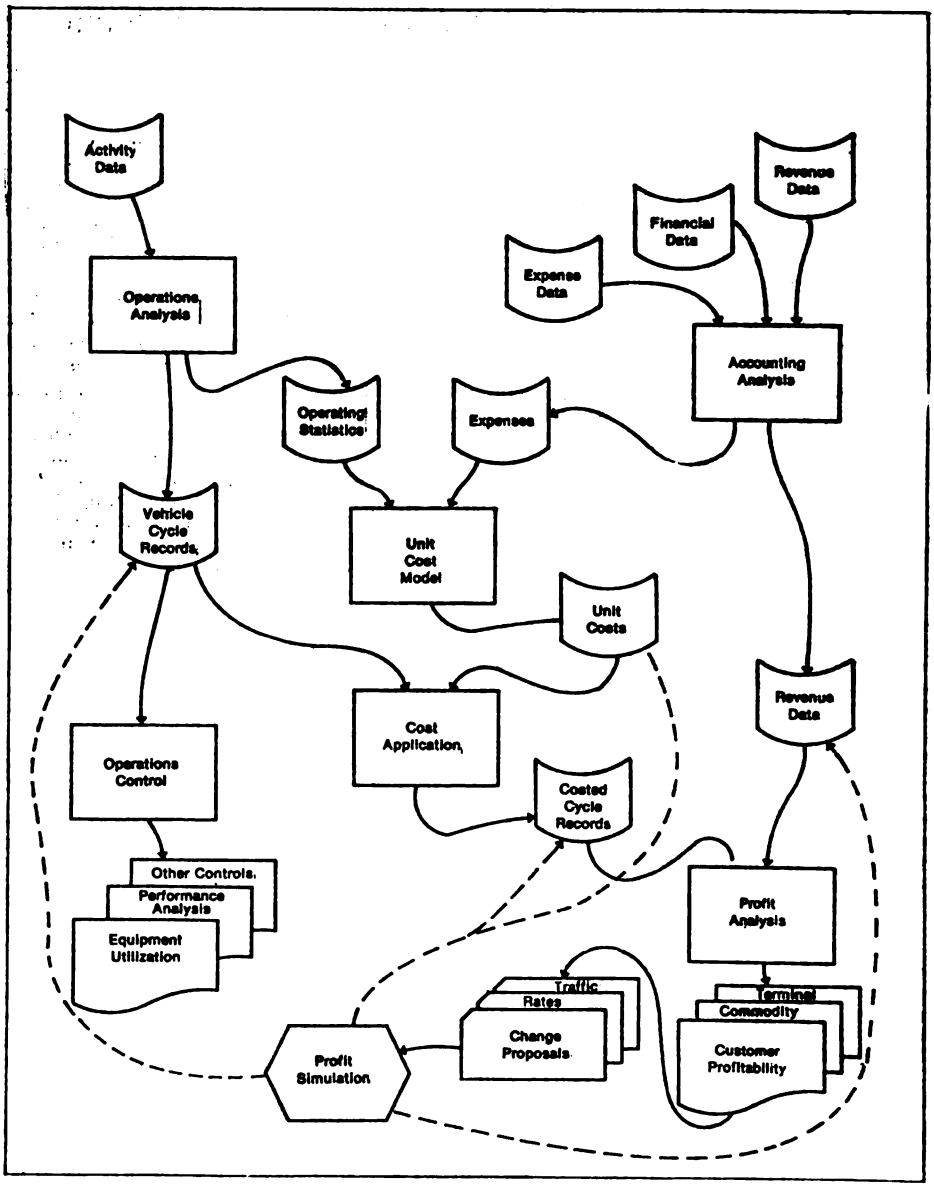

EXHIBIT 1