

DEVELOPING INTEGRATED FREIGHT TRANSPORT SYSTEMS IN LDCs: OPTIONS AND CONSTRAINTS

Oscar DE BUEN
Research Coordinator
Instituto Mexicano del Transporte
Queretaro - Mexico

INTRODUCTION

To generate foreign exchange, developing countries are abandoning approaches based on massive borrowing and exports of cheap raw materials. Instead, they are turning to increase exports of non traditional products, such as manufactures and items with more value added per dollar. Since permanently depressed salaries cannot be the sole source of their comparative advantage, their exports need to be increasingly based on the true competitiveness of their economies. This involves not only the products themselves, but also a series of support services, one of which is transport, that must effectively contribute to the overall goal of augmenting the share of manufactured products within their export mix.

The major players in world trade are the industrialized countries. In 1985, these countries accounted for two thirds of world exports and almost eighty percent of manufactured exports. They also imported almost 70 percent of general and manufactured exports from all sources. Developing countries generated 22.9 percent of all exports, but only 12.4 percent of manufactured exports. In both categories, about two thirds of their exports went to developed nations (see Table 1).

The figures show that the major international trade flows occur between industrialized countries. In many cases, and perhaps particularly in manufactures, these transactions often imply strict requirements that sellers must fulfill if they want to succeed. Today, such needs not only refer to product quality, but also to shipment sizes, frequencies, service reliability, support and costs, among other attributes which directly deal with transportation. The figures also show that a large share of exports by developing countries are directed to buyers in industrialized nations, and thus it can be concluded that many of the international transactions of developing countries need to be supported by transportation, logistics and physical distribution systems capable of performing with the service levels that buyers are accustomed to. If they are unable to find such support, buyers will simply turn to other sources capable of performing according to their expectations.

TABLE 1
 WORLD EXPORTS OF MERCHANDISES AND MANUFACTURES BY
 MAJOR AREAS, 1985
 (Percentages by trade value)

| ORIGIN | D E S T I N A T I O N | | | | | | | |
|----------------------|-----------------------------------|------|--------------------------------|------|-----------------------------|------|-----------------------|-------|
| | Developed Countries All Manuf. | | Developing Areas All Manuf. | | Trading World All Manuf. | | Eastern All Manuf. | |
| Developed Countries | 49.8 | 58.1 | 13.1 | 16.5 | 3.4 | 4.2 | 66.3 | 78.8 |
| Developing Areas | 15.3 | 8.1 | 6.1 | 3.6 | 1.5 | 0.7 | 22.9 | 12.4 |
| Eastern Trading Area | 3.1 | 1.6 | 2.0 | 1.6 | 5.7 | 5.6 | 10.8 | 8.8 |
| World | 68.2 | 67.8 | 21.2 | 21.7 | 10.5 | 10.5 | 100.0 | 100.0 |

Source: (1)

1. OPTIONS FOR AN INTEGRATED FREIGHT TRANSPORT SYSTEM

The competitive pressures in the market and the strict requirements by users have forced transport operators in the world to adjust to the need for increasing service quality while at the same time fighting tendencies towards lower transport rates brought about by deregulation, overcapacity and competition. To adjust, they have searched for options that allow them to stay competitive. Basically, as presented in reference (2), they have focused on achieving one or more of the following advantages:

a) economies of scale to lower average service costs at increasing traffic volumes.

b) optimal use of the available modes by taking advantage of their cost structure and economizing in the provision of combined services.

c) market penetration via special services to increase user satisfaction and provide him/her with customized services to attend his/her logistics needs.

d) economies of density to lower average service costs and increase market penetration through the efficient combination of service networks.

e) factor productivity increases through investments in new technology, better management skills and/or labor renegotiations.

In general, the search for these advantages has pushed transport operators

towards intermodalism, defined as "the sequential use of two or more forms of transport to complete a coordinated movement of goods" (3). The container has been a key factor in the growth and penetration of the concept of intermodalism. In principle, transport operators in both the developed as well as the developing world can achieve these advantages. The latter, however, face greater difficulties and problems and thus find it harder to provide the necessary support for exporters in their countries.

The need to adjust to user requirements and to provide high quality, door to door services at competitive prices has brought about substantial changes in the nature and composition of transportation supply throughout the world. Megacarriers, integrated multimodal transportation and distribution companies and large scale ports are products of the changes that are taking place. In much of the developing world, however, transport operators have historically been unable to reach the levels of sophistication and market responsiveness of their colleagues in industrialized nations. In many countries, they were protected from competition by regulations favoring them at the expense of shippers and exporters. Today, as the strategic need to increase participation in foreign trade demands a different role from transport, they must change and adapt to it.

The need to implement these changes, however, coincides with worldwide structural adjustments in the nature of transport services and the composition of transport markets, which are being problematic even for operators in developed countries. The complexity of the task facing local transport operators increases because most of them must perform in local and regional environments where existing restrictions and difficulties put them at a disadvantage with respect to transport service providers in more developed countries.

In the following sections, this paper will review some restrictions that transportation service suppliers in the developing world must face when trying to achieve the above-mentioned advantages. The final section concludes with general proposals for helping countries to create local conditions that are favorable for a greater integration of their transport systems.

1.1 Economies of scale

One of the most powerful means available to transport operators to reduce service production costs is to achieve economies of scale. In the transportation sector, these are feasible in many different ways. For example, recent innovations introduced to move larger freight volumes at lower average costs per ton can be found in the development of high capacity, double-stack container train services in the U.S., the construction of fifth generation cellular containerships, the concentration of large maritime freight volumes in a few megaports of worldwide coverage and the tendency

to introduce double and triple trailer trucks in some routes in certain countries.

In developing nations, the feasibility of introducing such innovations to achieve lower transportation costs is mostly low. Comparatively small traffic volumes, inadequate geographical location with respect to the most heavily trafficked international corridors and unbalanced freight flows make it difficult, if not impossible, to reach levels of operation that permit significant economies of scale. As a consequence, transport costs are higher. Reference 4 shows that in 1988, freight costs in the whole world were 5.27 percent of import value. In developed market economies, however, that percentage was only 4.4, while in developing countries in Africa, America and Asia it was, respectively, 11.3, 8.48 and 8.39 percent.

Peters (5) provides evidence that gives an indication of the difficulties that developing countries face in achieving economies of scale in container transport. Technological development in the shipbuilding industry has allowed to lower the ship operating cost for a 20-foot equivalent unit (TEU) by 40 percent between container-ships built in 1982 and 1986, mostly because of the latter's larger size. As a consequence, the average containership in the Trans-Pacific trade expanded from 1,200 to 2,800 TEU during the same period. However, since the daily fixed costs of these ships have increased substantially, there is pressure on the ports to achieve very short ship turnaround times. As a consequence, they are forced to undertake costly investment projects that are frequently unfeasible for port operators in developing regions, both because of low prospective traffic volumes and high capital requirements.

Thomas and Roach (6) present a comparative cost analysis of several container equipment systems for annual throughputs of 100,000 and 250,000 containers, respectively. The results, which cover only equipment costs and thus do not include land acquisition and infrastructure costs, reveal container handling costs that are between 16.4 and 31.2 percent lower for the large terminal than for the small one. However, in 1988 only 14 developing countries moved, at a national scale, more than the 250,000 TEUs needed to achieve the documented economies. Of the 14 countries that surpassed that total traffic, 8 were located in the South East Asian Region. Thus, cases in which developing countries may take advantage of the operational economies involved in large scale container terminals tend to be scarce.

Another example of the difficulties for developing countries to reach economies of scale as compared to competitors in developed nations is illustrated by Mexican trucking. Although typical operating costs in Mexico could be expected to be lower than in the U.S., the cost structure of trucking firms in both countries reveals that this is untrue (7). Of the major cost components (salaries, depreciation, maintenance and spare parts, fuel and tires), only salaries and fuel reveal some advantage to Mexican truckers. Depreciation costs are about 30% lower in the U.S., because new and used equipment prices are lower in part due to the large size of the market; maintenance and spare part costs are often twice as large in Mexico as in the U.S. because of the

older fleet, the greater need for maintenance and the small lots of spare parts bought.

1.2 Optimal use of available transport modes

One basic fact of transport economics is that modes, due to their cost structure, have certain advantages for specific traffic types. Thus, railways have historically been regarded as especially cost-effective for large volumes of low-density traffic moved over long distances, trucks for pickup and delivery services over short to medium distances, pipelines for bulk liquids, and so forth. In developed countries, transport infrastructure has expanded over a long time and has favored the emergence of a reasonably well-balanced transport system that leads to an economical traffic distribution.

In most Third World nations, the development process began later than in Europe and North America. Therefore, modern transport infrastructure is either lacking or incomplete. As Table 2 shows, this is reflected not only in the comparatively lower road and rail network densities than in industrialized nations, but also in the availability and weak connectivity of rail and pipeline networks. The Malaysian railway network, for example, consists of 1658 route-kilometers belonging to the main line along the west coast, the east line and several branch lines (8). In many countries, facilities for intermodal transfers are either lacking or in bad operational conditions, as often happens in ports. As a consequence, modal traffic distributions are heavily skewed towards roads, as Table 3 shows.

TABLE 2
NETWORK DENSITIES

| Country | Road (Km/Km ²) | Rail (Km/1000 Km ²) |
|----------------------------|-------------------------------|------------------------------------|
| Germany (Federal Republic) | 2.0 | 110 |
| Great Britain | 1.6 | 72 |
| Sweden | 0.4 | 25 |
| United States | 0.67 | 25 |
| South Korea | 0.55 | 64 |
| Malaysia | 0.12 | 5 |
| Kenya | 0.09 | 3.6 |
| Pakistan | 0.15 | 16 |
| Argentina | 0.08 | 12 |
| Brazil | 0.16 | 3.5 |
| Mexico | 0.12 | 13 |

Sources: 8,9,10,11.

TABLE 3
MODAL DISTRIBUTION OF FREIGHT TRAFFIC, (TON-KM)

| Country | Road | Rail | Waterways | Pipeline | Air |
|----------------|------|------|-----------|----------|------|
| U.S., 1989 | 21.2 | 31.1 | 28.6 | 18.8 | 0.3 |
| France, 1984 | 47.9 | 33.3 | 4.8 | 14.0 | -- |
| Japan, 1984 | 46.2 | 3.0 | 48.3 | N.A. | 0.1 |
| Spain, 1984 | 74.2 | 7.2 | 16.7 | 1.9 | --- |
| S. Korea, 1987 | 23.9 | 37.3 | 38.6 | N.A. | ---- |
| Malaysia, 1987 | 73.6 | 8.0 | 18.4 | N.A. | ---- |
| Brazil, 1986 | 52.0 | 24.0 | 20.0 | 4.0 | ---- |
| Mexico, 1987 | 60.3 | 21.7 | 10.0 | 8.0 | ---- |

Sources: 8,9,10,11.

The prevailing network conditions restrict the intermodal options available to transport operators. In many cases, since lower cost options are unavailable, roads are the only alternative. In others, intermodal transfers of goods are hampered by lack of physical infrastructure and by cumbersome operational and documentation procedures that induce many operators to renounce a priori to any potential economies and stay within their own mode.

From an infrastructure perspective, the lack of user-oriented facilities, such as railway sidings providing access to shipper premises or freight consolidation terminals to improve the quality of service for small shippers while simultaneously achieving economies also hurts transport operators. In Mexico, for example, recent interviews with exporters (12) showed that many potential rail users do not even consider the choice of rail because they perceive its service quality as below the minimum which they are willing to accept.

1.3 Market penetration

By learning how their services fit within the overall logistics systems of their clients and tailoring them to meet their specific needs, transport operators in the developed world are increasing their competitive edge while at the same time carving market niches which allow them to charge higher rates for specialized, high quality services. Non vehicle operating common carriers (NVOCCs), including freight forwarders, have played a significant role in this process by offering clients services designed especially for them.

For operators in developing countries, one of the most common barriers to offer

innovative transportation and logistics services is the presence of excessive regulations. Despite recent efforts by many countries to facilitate transport flows by deregulation, in many cases the process still needs to be extended to related areas, such as customs, insurance and status of freight forwarders. The heavy and lengthy protection that regulation gave to transport and infrastructure operators in many countries has left them weakened to pursue market-oriented strategies to improve service quality and increase business opportunities.

When they exist, progressive transport operators and freight forwarders in developing countries usually face the fact that many of their potential customers are themselves unaware of the competitive potential they could extract from high quality, third party transport, logistics and distribution services. For example, recent surveys of Mexican, Chilean and Argentinian exporters (12,13) revealed almost all of them to ignore what Electronic Data Interchange (EDI) Systems are, what they do and the opportunities they offer for their international business.

1.4 Economies of density

As transport networks have extended and developed intermodally, another great source of potential cost savings and service penetration has been tapped by taking full advantage of the variety and quality of the services that can be provided on large-scale networks. For example, the provision of integrated, door to door services that combine ship, train and trucking links has allowed the emergence of international, multimodal megafirms that provide high quality transportation, logistics and distribution services throughout networks with worldwide coverage.

While such trends may prove advantageous for shippers in the developing world having access to such networks (for example, exporters in South East Asia or in Mexico, where the nature and variety of transportation services has changed dramatically during the last few years, mostly as a consequence of deregulation and of ease of restrictions for private companies to invest and participate in transport), they pose an undoubtable threat to modally oriented local operators.

Examples of how international operators are exploiting networks in ways that are difficult to replicate by operators in developing countries include, in air transportation, computerized reservation systems and frequent flyer programs that allow airlines to capture and keep traffic in their extensive international and domestic networks. In maritime transport, the most important lines have dedicated terminals with excellent connections to rail and trucking networks that allow them to provide intercontinental door to door services of high quality.

For transport operators in developing countries, one of the most significant obstacles towards achieving economies of density is the large capital requirements needed to develop and operate these large networks. Other drawbacks include the

lack of organizational and management skills that are needed to set up, operate and control services over such networks, as well as the lack of connectivity in their networks and the insufficiently developed international contacts that would allow them to team up with foreign transport providers.

1.5 Productivity increases

Given the status of existing transport systems, both in the developed as well as in the developing world, actions leading to productivity increases are always open to transport service providers to improve their competitiveness and their support to economic and commercial activities. Capital investments in new technology, labor restructuring and better management are the most typically applied actions to increase productivity.

Galenson (14) identifies a number of technologies that have contributed to dramatically increase productivity in transportation. Some of the most important among them are, in maritime transport, the unitization, contenerization and increased use of computers in cargo handling; new loading and unloading systems for dry, liquid and break bulk cargo; and larger vessels and automation of on-board activities. In railways, the shift from steam to diesel and from diesel to electric; new braking systems; automatic signalling techniques; mechanized track maintenance and improved loading and unloading techniques. In air transportation, cockpit innovations on new aircraft and widespread use of computer reservation systems.

Despite the availability of these technologies, in developing countries there are barriers that make it difficult to achieve their full potential. One is the need for large capital investments relative to traffic. The following typical expenditure budgets for transportation, in millions of current dollars, provide an idea of the scale of feasible investments in developing countries: Korea, 1,470 (1987); Malaysia, 380 (1988); Pakistan, 870 (1988); Thailand, 570 (1986); and Philippines, 340 (only capital outlays, 1987). When these investment budgets are compared with typical costs for modern transportation infrastructure and equipment, it can be concluded that only limited action is possible.

Sometimes, the investments made cannot be adequately operated because of labor restrictions that are difficult to change, at least in the short run. Galenson also cites common labor practices that preclude obtaining full advantage of new transportation technologies, such as crews that are not reduced when new technology is introduced; excessive gang sizes that crowd the working place and generate negative marginal products of labor; working conditions frequently tied to obsolete technologies; geographical and organizational constraints that impede adequate staffing; and complicated hiring and firing actions because of institutional constraints.

In addition, inadequate management practices, notably the lack of preventive

maintenance, erode the equipment and facilities available and make them perform at non optimal capacity and cost levels. Thus, the lack of preventive maintenance increases the operating costs of heavy vehicles. According to reference 13, as road condition deteriorates from good to fair, heavy vehicle operating costs increase on the average by 11-14 percent. If pavement condition passes from good to poor, the respective cost increases are 30-38 percent. These costs translate into equivalent percent increases in cost per ton-kilometer produced. To refer again to Mexican truckers, this is another reason why their costs are higher than those of their American counterparts.

2. CONCLUSIONS

For developing countries, the provision of efficient transportation, logistics and distribution services is being increasingly recognized as strategically important for the success of their export efforts. The paper has argued that an integrated transport and distribution system is required to achieve some of the options that transport operators worldwide pursue to increase service quality and lower costs. It has also pointed out some barriers to implementing such options, as well as particular difficulties common in developed countries.

Despite the existing difficulties, developing countries cannot remain passive; they must implement measures to promote the development of integrated transportation systems to lower costs for exporters while at the same time increasing service quality. The actions to be undertaken fall under the responsibility of governments, operators and users, but there is a need for a coherent, varied and mutually reinforcing strategy at a national level.

The policy elements to be included in that national strategy should be based on a flexible regulatory environment that allows the different actors to pursue business opportunities that increase the range of services available to those involved in foreign trade, while at the same time protecting the public interest and not allowing the emergence of private or public monopolies. Specific recommendations might include:

- concentrate traffic volumes in selected corridors and facilities to justify projects leading to scale economies and to higher returns on investments in modern transport technology;
- take advantage of economies of scale in transport flows occurring in other countries by a more open and systematic approach to distribution problems. For example, some foreign traders in South America may find that intermodal options involving landbridges in the United States help them lower costs, increase frequencies and reduce shipment size and travel times.
- ensure that investment decisions on transport network extensions are based on commercial and economic criteria rather than on traditional service coverage and equity considerations;

- improve transfer facilities, freight consolidation and load centers to remove physical barriers to intermodality and reach a broader and increasingly varied client base;
- promote training at all levels of the transportation community, emphasizing modern management for transport businessmen, operational skills for drivers and operators and physical distribution and logistics management for shippers and transport users.
- let progressive actors, such as freight forwarders and logistics service providers, operate in a flexible environment to take advantage of the fact that their legitimate interests coincide with the integration of national and international freight transport systems;
- encourage local and international operators to agree on initiatives for joint service production and marketing, as well as on transfer of technology;
- attract private participation to the direct provision of services and to new areas of work in which local services have been either scarce or inexistent;
- provide a flexible framework for labor negotiations to introduce new technology and achieve increases in productivity.

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