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INTEGRATED USE OF TRANSPORT SYSTEMS
IN DEVELOPING COUNTRIES

By

MEHDI SHAMSZADEH
Islamic Republic of Iran

A dissertation submitted to the World Maritime University in partial fulfillment of the requirements for the award of the degree of

Master of Science

in

GENERAL MARITIME ADMINISTRATION

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I certify that all the material in this dissertation that is not my own work has been identified, and that no material is included for which a degree has previously been conferred on me.

The contents of this dissertation reflect my own personal views, and are not necessarily endorsed by the university.

(Signature)........................................

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GLOSSARY OF ABBREVIATIONS

CFS  Container Freight Station
CMR  The Convention on the Contract for the International Carriage of Goods by Road
CIM  The Convention Concerning the International Carriage of Goods by Rail
CTO  Combined Transport Operator
EDI  Electronic Data Interchange
EFT  Electronic Fund Transfer
FCL  Full Container Load
FEU  Forty Equivalent Unit
GATT General Agreement on Tariffs and Trade
GDP  Gross Domestic Products
GNP  Gross National Products
ICC  International Chamber of Commerce
ICD  Inland Clearance Depot
IMF  International Monetary Fund
ISO  International Standard Organization
ITS  Integrated Transport System
LCL  Less that Container Load
MTO  Multimodal transport Operator
MTS  Multimodal transport system
NFP  Net Factor Payment
NTR  Net Unrequited Transfer
SDR  Special Drawing Rights
STCC  Standard Transportation Commodity Codes
TEU  Twenty Equivalent Unit
TOFC  Trailers on Flat Car
UCS  Uniform Cost System
UNCTAD United Nations Conference on Trade and Development
PREFACE

The multimodal transport concept aimed at providing an efficient transport service, is one of the most cost-efficient system of transportation to move cargo from origin to destination. The benefits of integration of different transport systems should compel developing countries to optimize their transport systems by adopting a multimodal concept. However, this concept is complex with regards to its implementation on a world-wide scale. In the light of fundamental differences in geography, nature of trade, infrastructure, and government policies in various part of the world, the concept becomes even more complicated.

It is unavoidable that the MTS practices and strategies adopted by various countries will differ among various regions of the world and sometimes within the same region. Containerization as a basic initiative and tool of the MTS has achieved a high degree of standardization on a global scale, but the MTS has yet to advance in many countries to the point of achieving a global standard. This is due basically to differences among countries in technology and legal matters. Since technology is something to be acquired by a nation, and largely depends on the financial capacities and technical expertise of any country, achieving a level of global standardization is an ambitious goal for developing countries. But, the international legal framework can be achieved relatively more simply, by implementing international rules and regulations for harmonization.

The initiative taken by UNCTAD deserves a lot of credit, and should be appreciated by all nations around the world. On May 24, 1980, the final act of the “United Nations Conference on a Convention on International Multimodal Transport of Goods” was signed in Geneva under the auspices of UNCTAD. The convention was signed by a wide spectrum of countries, from the developing to developed countries, and recognized.¹

(a) that international multimodal transport is one means of facilitating the orderly expansion of world trade;

(b) the need to stimulate the development of smooth, economic, and efficient multimodal transport services adequate for the requirements of the trade concerned;

(c) the desirability of ensuring the orderly development of international multimodal transport in the interest of all countries and the need to consider the special problems of transit countries;

(d) the desirability of determining certain rules relating to the carriage of goods by international multimodal transport contracts, including equitable provisions concerning the liability of multimodal transport operators;

(e) the convention should not affect the application of any international convention or national law relating to the regulation and control of transport operations;

(f) the right of each state to regulate and control, at the national level, multimodal transport operators and operations;

(g) the need to have regard for the special interests and problems of developing countries— for example, the introduction of new technologies, participation in multimodal services by their national carriers and operators, cost efficiency, and maximum use of local labor and insurance;

(h) the need to ensure a balance of interests between suppliers and users of multimodal transport services; and

(i) the need to facilitate customs procedures, giving due consideration to the problem
of transit countries².

The convention has defined multimodal transport as the carriage of goods by at least two different modes of transport on the basis of a multimodal transport contract from a place of origin in one country at which the goods are taken in charge by a multimodal operator to a place designated for delivery that is situated in a different country.

In this paper the term Multimodal Transport System (MTS) or Integrated Transport system (ITS) is always referred to the UNCTAD definition of Multimodal Transport. This transboundary movement of goods is the main reason, in which the MTS affects the foreign sector of economy. Hence, there is a need to particularly emphasize that establishing of the MTS is very important for developing countries where foreign currencies can play crucial role in economic development of these countries.

ABSTRACT

The aim of this paper is to identify different economic benefits of multimodal transport systems for developing countries, without giving any reference to a particular country. The potential economic usefulness of such systems from a macro-economic perspective is also addressed. The theoretical considerations as well as practical aspects of the industry is examined to give a better explanation of the total concept and its application to developing countries. Also, the main initiative of the MTS, viz. containerization, is examined and the various aspects of such a system are investigated.

In addition, different management and cooperation methods regarding effective implementation and application of multimodal transport systems in developing countries are discussed. Particular attention is given to specific operational processes suitable for most developing countries.

Different aspects of international trade, the economic criteria of developing countries and the role of a multimodal transport system are thoroughly examined. Also minimum infrastructure requirements are addressed along with a system analysis to facilitate an overall cost/benefit appraisal of establishing an efficient MTS. This includes a guide-line for planning the construction of the infrastructure required for the MTS. Also, economic categories of developing countries are considered to better demonstrate the minimum requirements for the formation of indigenous MTOs in such countries.

The main economic elements in the success or failure of MTSs in developing countries are discussed in the concluding chapter. In conclusion, the paper presents two economic models for efficient operations of the MTS in developing countries, i.e. necessary elements in establishing a local MTO, and investment policies for capital outlay required for effective operations of the MTS in these countries.
Introduction

International trade requires a proper network of transportation to transfer raw materials and fabricated goods from a place of origin to a destination, in which they might be changed to another form of commodity or to be consumed in a consumption center. Obviously the time spent in this transportation network is crucial, in that even seconds cost money both for the seller and the buyer of the goods. Therefore, the faster the transportation, the less cost incurred by the consumer. Herein lies the rationale for an efficient logistics and physical distribution system, in which all efforts are made to make sure that the goods are being transported in the fastest, safest, and the most convenient way possible.

The integrated transport system, or in other words, the Multimodal Transport System (MTS), is based on this approach; i.e. the goods should be transported in the fastest transit time by different modes of transport, and only by one operator, known as Multimodal Transport Operator (MTO).

In order to justify the primary objective of transportation, most experts have commonly stated that the product of transport is the safe arrival of goods, and passengers. (However, in this paper only the international transport of goods is considered). In addition, the economic function of transport is to provide the utility of place, i.e. the bridge which connects the producer and consumer of goods. Thus it will be learned, that how the efficient integrated transport system can serve both the goal, and economic functions much better than traditional transport methods.
Basically transport does two main things: enabling firms to locate away from their raw materials, and expand their markets. Many economists also believe that transport helps the poor nations to develop more rapidly. Another important economic fact about transportation is that in most countries it accounts for between 10 - 20% of GNP, which is a very significant figure. This suggests that transportation should be planned scientifically for efficient integration in order to reap optimum benefit for the economy. This issue of integration, however, has not been addressed adequately in most developing countries. One of the intentions in this paper is to show the economic significance of the MTS, rather than demonstrating the operations itself, which may be found in any ordinary text book written in this context.

It should be mention that in this work the primary intention is to show the economic importance of the integrated transport system for developing countries, with those characteristics which will be explained, in this introduction. In addition the operational procedures which lead to an efficient and successful system are confronted. It should however be realized that there are many other aspects of the industry, such as legal procedures and difficulties which due to constraints, can not be explained in this paper. Nevertheless it is hoped that this research work can demonstrate some economic impacts of the industry in the national context.

The other purpose of this research work is to examine the effect of modal integration of transport systems upon the foreign sector of the economy, i.e. export and import of goods. It therefore analyzes the impact of such a system on the macro level of a developing economy without giving any reference to a particular country. Recent trends toward a market forced economy in many developing countries have brought about the theory of consumer choice, in which the market is mainly determined by the consumer's income, the price at which goods can be bought, and the consumer's taste, and behavior toward the nature of the commodity. The most significant of these factors is the finished price of goods which by efficient and cost effective multimodal transportation, will eventually give the consumers the goods at consumption centers much cheaper than if
the same goods were moved by ordinary transportation system. Therefore, Multimodal Transportation effectively plays a vital role in consumer attitude towards a certain commodity due to considerable changes in the price of these goods.

The concept of integrated use of transport systems is an old concept. But practically, until the introduction of containerization, it had not been performed as a regular practice. This concept increases the efficiency of the whole procedure, reduces overhead costs, eliminates unnecessary processes, and finally gives better opportunity for various businesses to grow more rapidly, bringing more wealth for the society as a whole due to reduction in finished prices of goods.

This work is also aimed at showing the required planning needed to establish such operations, basically by national operators, and the impact which they may have on the logistics and distribution of goods. Different advantages of this system, and difficulties will be explained in detail. It is also examined the practical aspects of such systems rather than focusing on theoretical approaches.

The MTS benefits for a national economy resulting from items, such as shorter delivery from origin to destination, lower cost of transport from origin to destination, greater control of costs, schedules, and better safety standards are analyzed in this work. In addition some advantages such as contribution to the balance of payment, reduction in administrative work, and regulated system of distribution are examined.

The following figure represents a simple model of the transportation chain. The principal aim of the multimodal transport system in the logistics chain is to transport the goods under a uniform system and by one operator. The important distinction between the MTS and a conventional transport system is that the cargo moves along with information, and at any moment all parties concerned are aware of the complete cargo information, and can trace their interests on the cargo. In addition the cargo moves seamless and timeless without any stoppage in changing modes as the whole process is
arranged by one operator, through proper coordination of modes. This obviously requires skillful operation, expertise, technological capability, and in addition, the strict control of the transport network.

Bearing in mind that the transport industry is a highly competitive industry in itself, and that the demand for transportation is not always equal to its supply in many trading routes, specially for sea, and air transportation; therefore, new inventions to increase efficiency both in pricing, and timing will distinguish one operator from the other. The concept of integration of systems has been initiated because of this fact, and any operator who wants to remain in the market has to step forward, and demonstrate efficiency. This however requires heavy capital investment, and access to technology, and these are the present primary reasons why the developing world lags behind in these operations.

Today, the technological developments are such that the Multimodal Transport System can be used for neo-bulk cargoes, and some other bulk cargoes, even without containerization. However, due to the market practice, the current process is still employed on containerized goods, which are dealt with in this paper.
The research method used in this work is mainly based on academic research from books, reports, publications of various companies, and organizations, seminars, publications, and periodicals. Also interviews with experts in this field were carried out during field studies, and with visiting professors of the University. Furthermore observations are made on various successful transport firms, specially within the maritime and rail industries. Some questionnaires were also sent to different companies and experts about essential elements of the MTS.
CHAPTER I

MANAGEMENT AND OPERATIONS OF THE INTEGRATED SYSTEM

I.i. CONTAINERIZATION VERSUS DOOR-TO-DOOR OPERATIONS

Since containerization, and its rapid development, was one of the predominant factors in the progress and development of multimodal transport system, thorough knowledge of the characteristics of containerization is a key element in success or failure of the MTS. This section addresses this issue and gives specific guidance for effective operations in developing countries. Also, the general trends in technological and economic development of container movements, which are directly related to the MTS are examined.

Containerization has also facilitated cooperation between the modes of transportation and has expedited the realization of the concept of transport integration. One of the best known examples of such cooperation between two modes of transportation is TOFC (Trailer On Flat Car) usually referred to as "piggy back". Several variety of this service to ship loaded motor carrier trailers on a railroad flatcars exist.
Although containers were first used as long ago as the 1920s, the container revolution may be said to have started in April 1963, when the first “Sea-Land” service opened from Puerto Rico to Baltimore, USA. Two ships, The Mobile and the New Orleans, operated this service so successfully that Sea-Land began construction of the first container terminal in Baltimore. Since then, the use of containers has increased enormously, and now the variety available to freight forwarders demonstrates their versatility and popularity. Their use has had repercussions on the design of ships, on the operation of the ports, on rail and road haulage and on warehousing. It has necessitated new attitudes on the part of both management and labor.

It therefore has led to the development of integrated transport systems offering depot-to-depot or door-to-door services on world wide routes both for refrigerated and general cargoes. Such rapid development together with the structural changes in the pattern of international trade led to the swift shift of many developing countries’ volume of trade from break-bulk cargoes to the containerized cargoes. The clear evidence of this change is the very sharp annual growth of container movement from/to the ports in many developing countries. The percentage of annual changes in TEUs traffic of selected developing countries from 1990 to 1993 has shown an increase that has averaged approximately 17%.

Figure 1.1. presents the existing number of TEUs in world trade. It should be noted that the real figure for container movement in international trade is higher than this figure because other sizes and types of containers not generally used have not been reflected in this chart.

The container revolution eventually provided a door-to-door service from the point of inland origin to the point of inland destination, utilizing more than one mode of transportation, without having to reload individual pieces of break-bulk cargo. This is now accomplished with only one document and one operator responsible for the whole
operation. The nature of such service is important in a sense that instead of traffic meeting delays at every interface, where rail or road reaches the sea, or where the sea transit again changes back to inland transport at the port of destination, the containers move easily off one unit of transport and on to the other. The port ceases to be a bottleneck, and becomes a smooth linking mechanism between the different modes.

![World Container Fleet](image)

Fig.1.1. Changes in the World Container Fleet

Today containers are employed both in long-distance trades where carriage by sea is normally a major component and intermodal carriage where rail and road are the main modes of transportation. The practical realities of containerization have meant the introduction of new types of services both by traditional transport operators and by forwarders. The ownership of containers is often in the hand of a leasing company which hires them to merchants, shipping companies or forwarders.

Where there is a containerized shipping service, the carrier by sea may agree to carry a container filled by the customer. The normal practice is for the carrier to deliver an empty container to the customer at his premises. The customer packs and seals it, where-upon the container is carried to the container terminal at the port, shipped and
eventually delivered to the consignee who unpacks it at his premises. This is known as F.C.L. carriage. Since this usually involves the goods being collected from the consignor’s premises and delivered direct to the consignee, it may also be referred to as house-to-house carriage. Alternatively the carrier may combine the goods belonging to different customers and thus fill a container at an Inland Clearance Depot (ICD). The carrier will then carry the sealed container to a depot at the destination, remove the goods from the container and deliver them to their respective consignee. This is termed “Depot-to-Depot” or L.C.L. carriage. The important point about such cargo movement is that, without containers, such operations were not practically possible due to many operational, and legal problems which arise when cargoes are moved in break bulk form.

Introduction of containerization has brought both advantages and disadvantages for all parties concerned with transportation. These can be summarized as follows:

A. Advantages

1. Seamless integrated transportation is the primary product of containers.

2. They consolidate cargo, bringing into a unit load what was previously a number of smaller packages or crates, therefore reducing handling problems.

3. This unitized cargo is handled more quickly and more easily; thus, reducing loading and unloading time.

4. A very important advantage is that usually much less packaging is required. The cost of timber to make cases, and the labor involved can be very expensive. Less packaging also makes to stowage of a greater quantity of actual goods possible as opposed to goods plus cases in the same space.
5. The goods are carried more easily since they are better restrained than loose cargo. Thus, the traditional problems of shifting loads are not met with a well-stuffed container.

6. The carriage itself is economic since a fully loaded container represents economic utilization of that volume of cargo space, whether in a ship, or on a railway wagon or road haulage vehicle.

7. Pilferage is reduced. The sneak thief cannot pick-up and walk off with a container, as he can with loose cargo. Theft of containers is of necessity a large-scale operation, requiring conspiracy by a group of thieves. As conspiracy is more severely punished than mere theft, which is in itself a deterrent.

8. Simpler documentation can be achieved through containerization. A given volume of cargo requires much less documentation even if it is going to be a large number of eventual consignees. It means that, an MTO can also be specialized in unitizing cargo from a number of small consignors, who prepares documentation for the container as a single unit. The MTO then assumes the responsibility of de-stuffing the container at the far end of the journey so that individual items reach the ultimate consignee safely.

9. Insurance costs are reduced because individual packages no longer need to be handled separately, and the container offers good protections to its contents. In addition, once the container is sealed, losses due to pilfering virtually disappear. Thus, these factors influence in the proportion of insurance premium.

10. Containers make through-transit the logical and economic way to forward cargo. Thus, development of integrated door-to-door service by rail/sea - sea/road - road/rail is achieved.

Considering the points listed above, there is a formidable argument in favor of containerization and its close relation to the Multimodal Transport System. Despite the
problems inseparable from its use, the response of various parties, involved in transportation, to its introduction is evidence that these advantages reduce costs and are reflected in cheaper freight rate.

B. Disadvantages

1. Technical problems: The important aspects of container operations are the need to design, berths, container parks, handling facilities, appropriate cellular ships, and vehicles. These have presented enormous technical problems. Also different sizes of containers possessed various difficulties in compatibility which equipment and vehicles handling containers. At present, the operational container length in the United States is 20, 28, 40, 45, 48, 53, & 57 feet and height can go up to 9.5 feet. Some of these operational sizes are by no means compatible with ISO standards.

Because any manufacturer design and build containers according to customer orders (mainly leasing companies, and carriers); therefore, there are great varieties of sizes and types according to a specific market need, and route. Thus, to avoid this problem, all developing countries are urged to use ISO container standards. The International Organization for Standardization (ISO) has developed a number of standards for freight containers, which are now used in many countries. ISO standards for large, general purpose freight containers relate to definitions of terms, characteristics of containers, their weight, loads, dimensions, volume and marking, as well as components. They are classified into the series 1, and series 2. Table 1.1. presents the external dimensions of ISO containers.

The other problem is an ever increasing type, and design of various containers, which users of these components are faced with. This versatility of types, and characteristics require technical support, equipment and training for handling them, which poses both
heavy financial and technical burdens on the users, as well as customers of such containerized services.

2. Operational Problems: The main operational problem is to provide an integrated system, based on standard ISO containers, and maximizing the advantages according to their use. While these types of integrated operations illustrate the economics of container transportation, the capital costs of the facilities required are enormous, especially for developing countries, where scarcity of capital resources do not allow them to make required investment for further development of the infrastructure.

<table>
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<th>Freight container designation</th>
<th>Height</th>
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<tr>
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<td>2,438</td>
<td>+0/-5</td>
<td>2,438</td>
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<td>1C</td>
<td>2,438</td>
<td>+0/-5</td>
<td>2,438</td>
<td>+0/-5</td>
<td>6,058</td>
<td>+0/-5</td>
</tr>
<tr>
<td>1D</td>
<td>2,438</td>
<td>+0/-5</td>
<td>2,438</td>
<td>+0/-5</td>
<td>2,991</td>
<td>+0/-5</td>
</tr>
<tr>
<td>1F</td>
<td>2,438</td>
<td>+0/-5</td>
<td>2,438</td>
<td>+0/-5</td>
<td>1,968</td>
<td>+0/-5</td>
</tr>
<tr>
<td>1F</td>
<td>2,438</td>
<td>+0/-5</td>
<td>2,438</td>
<td>+0/-5</td>
<td>1,460</td>
<td>+0/-5</td>
</tr>
<tr>
<td>2A</td>
<td>2,100</td>
<td>+0/-5</td>
<td>2,300</td>
<td>+0/-5</td>
<td>2,920</td>
<td>+0/-5</td>
</tr>
<tr>
<td>2B</td>
<td>2,100</td>
<td>+0/-5</td>
<td>2,100</td>
<td>+0/-5</td>
<td>2,400</td>
<td>+0/-5</td>
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<tr>
<td>2C</td>
<td>2,100</td>
<td>+0/-5</td>
<td>2,300</td>
<td>+0/-5</td>
<td>1,450</td>
<td>+5/-5</td>
</tr>
</tbody>
</table>

Table 1.1. External dimensions (in millimeters) of ISO freight containers

There are difficulties when discharging containers at ports because there are no gantry cranes or especial container cranes. This problem can be best solved by putting the crane on ship, making it independent of shore-based facilities; thus, those ships can call for ports without having the required equipment. Although this is a short-term solution for
ports in developing countries, it can be considered as a good option not to spend the scarce capital on these expensive equipment.

The other operational problem which may be faced by rail and road hauler, is using non-specialized equipment, securing containers, thus stacking and moving them might be difficult, and sometimes poses dangers on vehicles as well as personnel on these vehicles.

Another difficulty particularly in container shipping is the problem of imbalance of trade in many developing countries which use containers. It therefore creates the difficulty of an empty container leg voyage, which possibly eliminates some economic benefits of containers, as well as adding up some operational delays due to re-stuffing containers to return them to port again for empty shipping leg.

Some other major operational disadvantages of containers are related to the need for a more complex system of organization and management, and the necessity for complicated lifting equipment. These equipment are expensive to provide and maintain and require highly skilled operators. There are also limitations in the type of goods suitable for containerized goods. However, technological developments in the recent decade have shown that such difficulty will not exist any more in the near future. Today a variety of goods is transported in containers, such as liquid containers, refrigerated, climate control, neo-bulk, waste/hazardous and SWAP bodies. Also different container types for various purposes are used, such as Side door, flat rack, open tops, garment, Autostack, and composites.

3. Financial Aspects: For developing countries to change from a traditional transport system to containerized transport, there is an instant demand for enormous capital expenditure by all branches of the transport industry, and the distribution networks. The port authorities need to provide special terminals, carnival and other facilities; shipping companies are required to design and build new ships, or modify their existing fleet. The railways and road haulers need to develop new terminals and vehicles to handle the new
mode of transportation. Construction of Inland Clearance Depot and Container Freight Stations must be began, because at every stage modification is in process and therefore, new documentation and communications are required.

The high costs of these developments require the establishment of a strict control over development finances. However it should be noted that all these requirements are essential for an efficient, and competitive MTS, and if any country wishes to just start such operation without any changes in existing transport infrastructure, definitely and without any doubt it will be a total failure.

Therefore considering the advantages and disadvantages of containerization, and accepting it as an integral part of the multimodal transport system, all developing countries are required to invest in this industry carefully, and operate the system in the most efficient way. There is no doubt that there are many difficulties on the way to maximize the optimum utilization of the containerized operations as a component of moving goods by the MTS.

Despite the hesitations and criticism, which resulted in the initial reluctance to enter the containerization era, the level of current commitments to the MTS by leading companies in the industry implies that transport carriers, either shipping, land based or air carriers, cannot afford to stands idle and passively watch these developments. Operators in developing countries should be aware that containerization is the engine of the MTS.

But it should be realized that if developing countries use the containerized system, it increases their competitive edge, and ultimately results in acquiring a large share of transportation of goods in international trade for operators from developing countries. Another obvious justification for containerization is the significant growth in understanding of exporters, and importers of the need to choose least-cost methods for movement of their goods. Therefore, if there is any desire for developing countries to participate in international movements of goods, containerization is the engine of such
activities, and the right answer for these countries is to initiate their participation in such operations.

I.i.ii. MULTIMODAL TRANSPORT OPERATIONS IN PRACTICE

The MTO as a transport operator offering the whole transportation of goods based on door-to-door movements of cargo from origin to destination, arranges and sub-contracts other operators to accomplish such service. He then remains responsible for any damage or loss of cargo under the terms of the MT document, or through a Bill of Lading. Depending upon whether he is VO-MTO (Vehicle Operating-MTO) or NVO-MTO (Non-Vehicle Operating-MTO), he should subcontract part of this service to other operators. Further, he must be able to offer complementary services, such as packaging, cargo consolidation, stuffing containers, and other distribution services, as well as weighing and measuring cargoes for various consignees, if they are being demanded by customers.

Thus the range of services which MTOs provide directly or through their subcontractors vary from MTO to MTO, and to some extent from country to country, depending upon the system of administration pertaining to the port area, inland terminals and inland modes of transportation, prevailing in each country. Individual MTOs therefore may have to undertake different types of operations depending upon the requirements of trade route which they serve. However, complexity and availability of a variety of services, are mainly dependent on sufficient flow of cargoes in order to utilize the optimum economic benefits of such integrated operations.

The list of tasks which should be performed by an MTO for carriage of either FCL or LCL cargoes based on door-to-door service, can be summarized as follows:

1. Contact/negotiations between exporter/shipper and the MTO.
1.1. Presentation by the exporter/shipper of all relevant information covering the project.

1.1.1. Cargo commodity/commodities: ordinary cargo - reefer cargoes - dangerous cargoes, heavy lift etc.

1.1.2. Weight and measurement.

1.1.3. Packing details, material, strength, type.

1.1.4. Marking.

1.1.5. Place of shipment.

1.1.6. Port of loading.

1.1.7. Port of discharging.

1.1.8. Final destination.

1.1.9. Delivery time according to sales contract.

1.1.10. Delivery terms, INCOTERMS 1980 specifications.

1.1.11. Payment terms - letter of credit conditions.

1.2. Transport quotation from MTO.

1.2.1. Presentation of company profile with reference to earlier completed transport contract.

1.2.2. Feasibility study/local infrastructure/climatic condition.

1.2.3. Presentation of transport combinations/alternatives sea/road/rail/air/inland water transportation.

1.2.4. Specification of proposed carrier: local/overseas.

1.2.5. Expected total transit time.

1.2.6. Offer for total transport operation door-to-door clearly stipulating transport route(s), transshipment points, charges covered by the transport offer, charges not covered by the transport offer. Supervision of the transport operation during the various phases.

1.2.7. Payment of freight and charges. Cash payment or credit arrangement.

1.2.8. Conditions of carriage - use of transport documents - regulations and international transport law and rules.

1.2.9. Local conditions and regulations for carriage of goods in country of destination.
1.2.10. Customs regulations in country of destination.

1.3. Concluding and issuance of final transport contract.

1.3.1. Negotiation of multimodal transport document stipulating all necessary details in order for the transport to be safely carried through to the final destination without misunderstandings.

1.3.2. Transport contract is signed by both parties.

2. Project planning - time schedules.

2.1. Production and coordination of project - dates. *

2.2. Assembly and packing of cargo dates.

2.3. Delivery time for shipment dates.


2.5. Final delivery at destination dates.

3. Contracts with sub-contractors.

3.1. Local inland transport - country of shipment.

3.2. Local terminal work.

3.3. Feeder transport.

3.4. Loading costs/terminal port of loading.

3.5. Sea transport.

3.6. Discharge costs/terminal port of discharge.

3.7. Local inland transport - country of transit/destination.

3.8. Possible customs clearance and transit documentation.

3.9. Loading and overland transport to final destination. *

3.10. Final customs clearance and delivery of cargo.

3.11. Assessment of responsibilities for the various sub-contractors in relation to each

* The items with this sign are only applied to LCL cargoes.
other and the total transport operation and payment of additional costs or charges if any.

4. Actual shipment.

4.1. Supply of clean containers and/or other types of unit loads ready for use at shippers’ premises.

4.2. Loading and stowage of cargo into containers and/or other unit loads.*

4.3. Checking that the cargo loaded in the containers or unit loads are in accordance with shippers’ packing lists/invoices, i.e. number of packages, weight, volume, short shipment/possible damage.*

4.4.1. Issuance of multimodal transport documents in exchange of payment of freight.

4.4.1.2. Issuance of multimodal transport documents without freight payment (collect).

4.4.2. Issuance of other transport documents, loading receipts, customs documents, certificate etc.*

4.4.3. Issuance of transport documents between the MTO and the other transport subcontractors.

4.5. Shipment effected.

4.6. Follow up on: Road haulier/inland transport operator; terminal operator; feeder operator; Loading operation on board ocean carrier; checking of container/unit load conditions/lock/seal.

5. Actual transport operation.

5.1. Follow up on actual operation.

5.2. Check on date of shipment, expected date of arrival - possible delays.

5.3. Issuance of explicit instructions to receiving agents/forwarding agents/carriers agents at port of discharge.

5.3.1. Discharge of goods at port of discharge.

5.3.2. Terminal work.

5.3.3. Customs procedure and documentation.

5.3.4. Calling forward and checking on onward transportation of cargo by road or rail.

5.4. Arrival of shipment at port of discharge.
5.4.1. Follow up and execution of planned procedure through supervisory staff.
5.4.2. Actual discharge.
5.4.3. Loading operation inland carrier.
5.4.4. Checking out possible damage.
5.4.5. Checking on all relevant documents.
5.4.6. Shipment continues.
5.5. Arrival of shipment at final destination.
5.5.1. Receiver will produce original multimodal transport document properly endorsed if necessary, or in lieu of original MT document, a bank guaranteed indemnity, indemnifying the carrier against any claim on releasing the cargo.
5.5.2. Arrival of cargo at local terminal/shippers premises.
5.5.3. Receiver will produce necessary documents for customs clearance.
5.5.4. Cargo is subsequently inspected and cleared by customs officers.
5.5.5. Customs duty and charges are paid.
5.5.6. Containers or unit loads with cargo are thereafter delivered at receiver premises.
5.6. Unloading procedure.
5.6.1. Check on: contents of cargo; Number of packages; weight and measurement; possible sign of damage, pilferage and/or theft.
5.6.2. Final acceptance of cargo by receiver, who will sign the waybill as evidence of clear receipt.
5.7. In case of damage to the cargo.
5.7.1. Cargo surveyor to be called for inspection of cargo.
5.7.2. Damage report is made out, whereafter insurance company is notified.
5.7.3. Issuance of relevant documentation making specific carrier/agents/forwarding agents or other parties responsible for their obligations for the transportation/clearing/handling and on carriage of the goods.
5.7.4. Possible claims are handled and negotiated and concluded.
5.7.5. When settlement has been reached, payment of settled amount is made either to shipper or receiver according to the agreed condition.
5.7.6. Final settlement between MTO/carriers/agents/forwarding agents and cleaning
. and handling parties/insurance company.

5.8. Shipment finally concluded.

5.8.1. Follow up with shipper/receiver, presentation of invoice covering expenditures which were not covered by the transport contract³.

This list comprises the various tasks which should be performed by an MTO. In practice, the execution of all these duties requires an international network of agencies and branches, proper communication systems, cooperation with different transport companies, integration of various resources of other organizations, and cooperation with government agencies, port authorities, and many other individuals who are involved in this operation.

Thus, it can be stated that MT operations are very complex and require a high level of expertise. Domestic MTOs in developing countries should therefore try to upgrade their level of expertise, enhance their communication and cooperation networks, and learn how to practically perform such complicated operations in order to be competitive with MTOs in developed countries.

I.iii. MANAGEMENT AND COOPERATION

The concept of movements of goods in the light of the total distribution system, always included; producers, shippers, ocean and land carriers, ports, inventory control, warehousing and freight forwarding working separated from each other under different terms and means of operation and carriage contracts. Indeed management of such a complex system and integration of these activities is beyond the work of science. It is actually an art which requires a very high level performance and understanding of the total operation.
Such a system virtually implies close cooperation and coordination among various elements. The physical distribution of cargo, then involves an integrated logistical system, in which the justification for a single mode of transportation to exist as an independent operation has been weakening. Thus, the relevance and effectiveness of sea going vessels, trucks, railroads, and ports are evaluated in relation to their roles as individual elements within a total system.

Almost any new development, investment, or decision made by ocean and land carriers today takes full account of the whole picture of an integrated transportation-distribution system. Hence, management of this operation needs to identify the strength and weakness of various elements and based on such evaluation, decide on choosing the route and ways in which the operation will successfully be accomplished. These elements with regards to technological factors are illustrated in Table 1.2.

<table>
<thead>
<tr>
<th>The key elements in MTS</th>
</tr>
</thead>
<tbody>
<tr>
<td>1. System concept.</td>
</tr>
<tr>
<td>3. Control over cargo.</td>
</tr>
<tr>
<td>4. Merges.</td>
</tr>
<tr>
<td>5. Multi-modal companies.</td>
</tr>
<tr>
<td>6. Sea, air and land carriers.</td>
</tr>
<tr>
<td>7. Modal integration.</td>
</tr>
<tr>
<td>8. Through rates and billing</td>
</tr>
<tr>
<td>9. Information system.</td>
</tr>
<tr>
<td>11. Deregulation.</td>
</tr>
<tr>
<td>12. Multi-rate structure.</td>
</tr>
</tbody>
</table>

Table 1.2. The key management factors

To achieve the MTS objectives, i.e. transporting goods in the most cost effective and time efficient way, intensive cooperation and coordination among transportation modes are essential to be obtained. In fact, the degree of cooperation and the extent of the mutual commitments among the various elements of the transportation system that mark the multimodal concept. Carriers can no longer operate on the basis of maximizing their
own profits and displaying no regard for other links in the transportation-distribution system. Figure 1.2. represents the close link of different modes of transportation, and importance of cooperation and effective management for successful operations.

As a result of such effective management and cooperation, all the relevant transport modes, without exemption should adopt themselves, or being adopted to the requirement of the multimodal era.

![Diagram](image)

**Fig.1.2. MTS management should dealt with various issues**
This cooperation of various modes, actually should be one of the significant result of containerized trade which can bring shipping lines and rail/road carriers very close to each other, and establish a proper cooperative and integrated system.

Indeed, the issue of effective management, integration and coordination of different modes of transportation is the key element in operational progress of the MTS, particularly in developing countries whereas there is always missing a cooperative body between various modes, inland interface, and governmental agencies.

The management issue should therefore be considered carefully in developing countries. An MTO management team has to coordinate different carriers who are sub-contracted under terms of the MT document, as well as cooperate with government agencies and cargo owner(s). Management should also have strict control over the costs of transport, and timing of the total operation.

In fact, management of a MTS in developing countries does require certain quality elements in addition to managing the traditional transport system. But, it does not mean that developing countries step aside and do not participate in such operations. Looking at the primary goals of multimodal transport systems, which is the fastest transport time, by the most cost efficient way, developing countries can, and should perform such operations through the proper network of coordination within and outside the country by an effective management and cooperation system.

I.iv. PRIMARY BOTTLENECKS AND OPERATIONAL OBSTACLES

It is often argued that the MTS results in more complicated system of transportation, in which more sophisticated equipment and cargo handling systems are required. In
addition, it requires a very huge capital to be invested, which usually developing countries do not have such capabilities. Its effects on the pattern of employment is one of the other economic arguments, which is to some extent valuable in developing countries. However, it should be noted that the capital outlay for investment on advanced and high technology equipment in developing countries may not be as much as the same requirement for developed countries. Since developing countries have the comparative advantage of cheap labour, therefore they may not require to invest on very capital intensive industry at the first stage of integrated system. It therefore may be possible that with efficient management of the system and coordination of various elements of the MTS and skillful labour such tasks are performed as efficient as by using high technology equipment.

The intention however, in this section is to illustrate the main operational and legal difficulties which might be experienced by the MTS operation in developing countries. Therefore the main, and general problems which are almost valid in all developing countries are encountered.

A. Customs and Administrative Formalities

The customs have always been known as one of the primary obstacles for the smooth flow of cargo in the transportation industry. It usually is a process whereby imports/exports cargo should be inspected, and required government duties to be paid upon export/import of that cargo by the cargo owner or his representative. The customs control the national boundary for unauthorized smuggling of prohibited goods in and out of the country as well. Generally the customs as an organization working directly under the ministry of finance in many countries, have always been an influential organization in any country, because it brings considerable revenue for the government through customs duties and tariffs on goods in and out of the country. In particular, in developing
countries customs is a very powerful administration due to its financial earnings for these governments.

Typical problems, such as inadequate inspection equipment, lack of expertise, and manual handling of documentation are the main causes of significant customs delay in movement of goods to and from developing countries. A general survey on movement of goods from port to inland destination of selected developing countries, shows that the average time of transporting a container from port to inland is between 2 days and 3 months. This considerable difference in time is not dependent on the distance from the port, but merely the customs delay and administrative formalities in these countries. These figures are embracing when they are compared with the same situation in developed countries. The average time to transport the same container from port to destination inland, in most developed countries is just the reflection of distance of the destination from the port, and the choice of inland mode. The customs are by no means an obstacle in movement of goods.

The potential bribery and misapplication of the regulations for the benefit of the individual customs officers is another difficulty which the international trade in general and transport industry in particular have suffered for several years. This is true, particularly when there are various exceptions and clauses in the customs regulations of the countries. This allows the individual to take the advantage of the law and interpret it for his own benefits. Thus, inspecting personnel may cause extra delays in clearing the goods from the customs in order to earn additional income by unauthorized way.

These delays are the clear evidence of waste of time and money in most developing countries. The MTS is supposed to ensure seamless and smooth flow of cargo by different modes of transportation. Thus, the customs problem is the primary bottleneck to achieve the MTS’s objectives. This problem should be resolved in any country according to the prevailing needs of that country. But, a general guideline in order to reduce the customs delays will be given in this paper.
Thus, unless customs procedures are simplified, the potential advantages of MTS will not be realized. This is a particularly important field of action since it can improve the efficiency of the MTS as well as effectiveness of international trade without requiring the investment of huge capital, especially in developing countries where scarcity of financial resources poses a potential economic burden on these countries.

Developed countries have generally solved customs problems by ratifying international conventions and multinational agreements relating to customs procedures. Further, they have adopted new processes of customs inspection and computerized documentation procedures. Many attempts have been made to simplify and standardize customs formalities, which otherwise may constitute a barrier to trade because of the way in which their complex nature can result in restrictions on commerce.

One of the ways in which the MTS can be performed smoothly in developing countries is the ratification and implication of various related conventions, such as the Customs Convention on the International Transit of Goods (TI Convention), and the International Convention on the Simplification and Harmonization of Customs Procedures (commonly known as the KYOTO Convention) which attempt to reduce customs problems. The General Agreement on Tariffs and Trade (GATT) also contains provisions which represent progress in the same direction.

Besides these international efforts, the speed of customs procedures depends largely on what has been done in the country of departure. If reliable information regarding goods is incorporated into the customs clearance documentation, normally most of the customs inspection is accomplished.

The best way to tackle the problem of improvement of customs procedures is through simplification and harmonization of the documents required. Also special agreements between customs in the country of shipment and the country of destination will eliminate
dual procedures and reduce overlapping processes. Thus, adequacy of information should be provided in the country of shipment, and the place where the inspection of the goods should be carried out in the country of destination. These are two basic essential elements is reducing such problems. These two factors are reflected in the Multimodal Transport (MT) Convention as well.

The potential constraints in improvement of customs procedures in many developing countries consist of few elements. These are:

- Lack of financial resources for upgrading the existing inspection system.
- Non-existence of a computerized system.
- Inadequate and insufficient communications system.
- Lengthy delays in obtaining the necessary documentation.
- The high cost of developing an efficient customs system.
- Lack of standard procedures for clearance of different commodities

In these regards the most common themes for consideration are:

- High duty rates.
- Valuation and classification problems.
- Poorly trained customs brokers, and customs staff.
- Inefficient and inadequate procedures.
- Reluctance to change.
- Problems with accounting for cargo.
- A high level of cargo examination for both imports and exports.
- No analysis of the result of examination.
- Ambiguous definition of customs' duties and lack of proper laws and regulations.
Therefore it can be seen that there are ways in which the customs problems can be reduced to achieve the aims of the MTS. This is first, dependent upon government regulations to simplify the customs procedure, and required investments in customs facilities. Second, it requires the faithful practices of business firms in correct declaration of their goods, which consequently will result in mutual trusts between various parties, engaged in international trade.

B. Legal Difficulties

The legal problems concerning multimodal transportation are very complex and require a detailed analysis of potential problems as well as various legal regimes, which govern the international multimodal transportation. Thus, the comprehensive study of such legality cannot be addressed in this paper. However, an overview of potential legal difficulties can help readers about the problems which exist in development, and operation of the MTS.

As far as the MTS and door-to-door movement of goods are concerned, there is a single contracting carrier, i.e. the MTO. Therefore a single rate, a single claim responsibility and a single level of liability instead of juggling with CIM, CMR, Hague rules, Hague-Visby rules, Hamburg rules, and the Warsaw Convention should be used. Ideally the MTS concept should resolve all legal problems, since the cargo owner has contract with only one carrier throughout the transport operation. But, the real bottleneck is the existing international customary rules and regulations as well as already established international conventions.

When trade takes place among different countries, it is possible that each of these trading partners are contracting parties to different conventions. This creates conflicting opinions regarding responsibilities of various parties and the extent of each party’s liability. The other difficulty is that in the course of the MT operations, cargo crosses various liability
regime boundaries, i.e. land, air, sea, and rail. This poses a potential problem when something goes wrong and damage occurs to the cargo as to where the damage occurred.

The MT Convention has given a proper solution to these problems. This is referred to as the convention’s uniform liability system. It stated that damage to goods can be either localized, i.e. it is possible to determine on which mode of transport the damage occurred, or non-localized or concealed, i.e. it is impossible to determine where the damage occurred. One approach was to incorporate the precise rules relating to the specific modes into the multimodal transport contract whenever loss of, or damage to the goods could be localized to a specific segment. In that case, the claimant would be placed in the same position as he would have been if he had entered into a specific contract for that part of the transport. This is called the “network” principle, since the multimodal transport contract relies on the underlying network of rules governing the specific modes of transport.

In Article 18(1) of the MT convention, it is clearly stated that:

where the carriage involves a period of carriage by sea or by inland waterways, the MT’s liability for loss or damage to the goods is limited to 920 SDR’s per package or other shipping unit or 2.75 SDR’s per kilo, whichever is the higher.

By Article 18(3), where, however, the multimodal transport does not, according to the contract, include carriage of goods by sea or by inland waterways, the limit is set, at 8.33 SDR’s per kilo. Where, however the loss or damage occurred during one particular stage of the multimodal transport, and an applicable international convention or mandatory law would provide a higher limit than the limits above, then by article 19 the higher limit will govern the liability of the MTO. Thus the convention creates what can be termed above as “network” system of compensation.
It can thus be stated, that the provision of the MT Convention is one of the best solutions in resolving legal problems concerning multimodal transport of goods internationally. Furthermore, there is a close relationship between the convention and the ICC rules, which can be practically executed all over the world. The main important provisions are:

- The CTO (Combined transport Operator) / MTO acts as a principal for the entire transport.
- The CTO/MTO is liable from door-to-door.
- The CTO/MTO is allowed to issue either a negotiable or a non-negotiable MT document.
- The possibility of derogating from the rules/the convention is denied.
- A uniform minimum limit of liability for non-localized damage is imposed.
- A different limit of liability is case of localized damage is allowed.
- Licensing by governments of CTOs/MTOs is permitted.
- The CTO/MTO is liable for delay.
- The CTO/MTO is responsible for the acts of his servants and agents.
- The burden of proof of knowledge on the part of the CTO/MTO of the dangerous nature of cargo is placed on the merchant.
- The merchant is allowed to treat the cargo as lost if not delivered 90 days after the expiry of an agreed time limit.
- An unbreakable limit of liability is imposed unless the CTO/MTO has recklessly caused damage to the cargo.
- A time-bar for suits is imposed (nine months for the ICC Rules an the UNCTAD/ICC Rules for the multimodal transport documents; six months for the MT convention).

The banking practices in accepting only Bills of Lading is one of other problems which has been addressed in the UNCTAD/ICC Rules for the Multimodal Transport
Document. This can change the traditional banking practice by opening the L/C for the presentation of the MT Document instead of only the Bill of Lading.

As mentioned before, the legal problems of multimodal transport operations are very complex, and can't be addressed in this paper. Nevertheless, the author has tried to evaluate the main issues, in order to clarify some primary legal bottlenecks for the smooth operations of the MTS.

C. Operational Problems

The main operational problem in developing countries is concerned with inadequate financial capability and insufficient equipment to perform MT operations practically. To cope with technical and infrastructure requirements for efficient operation of the MTS, developing countries are required to meet certain minimum standards. (See chapter I).

The MTS has a tremendous potential for the transport industry at large. In its ideal form, the MTS should benefit the country considerably. Nevertheless, many problems, questions, and even doubts still remain with regard to vitality and success of the concept.

Various issues relating to profitability, equipment, standardization, level of cooperation among transport modes, variety of approaches to the actual practice of MTS, and the feasibility of diffusion of the concept on a global scale are among the main areas of concern. The main argument remains about the sufficient flow of cargo. For those who want to enter such operation and for the existing participants of the operation, that the resource capital and efforts required to expand the volume of MT traffic may not yield the appropriate return, particularly in many developing countries where the volume of traffic may not be sufficient enough to establish an MTS. Thus, this is a very delicate question for them to find a proper solution. This obviously requires a thorough market research.
Another problem is related to the profitability of operations. The MTS in many developed countries, after its initial stage, has not produced the revenues anticipated and the profit margin, if at all, is very thin. However, this has been the problem of international shipping for at least a decade.

At the organizational level, there is so far no commonly accepted documentation among transport operators, customs, and financial institutions to facilitate the through movement of cargo. This has also been a major drawback for many indigenous MTOs in developing countries.

It is hoped that the problems which are stated above can give a general overview of the difficulties and obstacles of the MTS. In this section, the main emphasis was to attempt to address the main issues, which concern developing countries when establishing an MTS. It can confidently be stated that the principal problems are highlighted in this section. However, there are still many other issues, which should be examined case by case, according to the nature of the problem which may happen in any country.
NOTES AND REFERENCES:


2 CI, TLI Analysis, 1991.


4 Some of these elements are extracted from Intermodality, the practice and concept. p. 14.

5 These figures are based on my questions to my fellow students at WMU. I have selected few countries from each continent, and the average results are reflected in these figures.

6 These provisions are extracted from MT convention and UNCTAD/ICC rule for Multimodal transport Documents.
Chapter II

PLANNING AND ESTABLISHMENT OF THE INTEGRATED SYSTEM

II.i. MINIMUM REQUIREMENTS TO FORM AN MTO

In establishing minimum requirements for a Multimodal Transport Operator (MTO) in order to be able to accomplish such operations in a developing country, he must meet certain criteria and obligations. This is based on the simple principle, that if anything went wrong he would be able to take the responsibility for any damages to the goods. In addition he should be able to fulfill his obligation against those carriers who have been sub-contracted under the terms of through transport.

In this section it is assumed that the necessary infrastructure including port, depots, rail, roads are readily available by the government through the tax payers money, who are using the system. Because the concept in this section only deals with operating companies' requirements, rather than the country's minimum requirements, i.e. infrastructure, and supra-structure, the necessary qualifying factors for being a MTO need to be identified.
In existing transport markets, there are mainly two kinds of MTOs, namely: Non-Vehicle Operating MTOs, and Vehicle Operating MTOs. (NVO-MTOs, and VO-MTOs ). (In most text books these are referred to Non-vessel Operating MTOs, and Vessel Operating MTOs. But, since all transport operators are involved in an MT operation, therefore a general definition to cover all modes of transport should be used. This means that transport operators either own vehicles to carry the good, i.e. vessels, airplanes, trucks, rail cars etc., or they do not own these vehicles. Therefore the term Non-vessel operating MTOs, which has mainly been referred to by UNCTAD, in the author’s opinion only covers a specific segment of the industry i.e. when ocean transport is involved ).

Hence, there is an important distinction in the nature, and physical operations among these two groups, i.e. their existing assets. Their potential for operating under the integration concept, should therefore be treated differently. However, the intent in this paper is to expand this view, and give an overall assessment of the requirement for establishing a multimodal transport company, particularly in developing countries. Therefore in the process of such assessment, the magnitude of the operations, as well as annual turn over (T/O) are the primary factors for consideration.

For any firm interested in operating in a multimodal transport environment, and being responsible for arranging the whole transportation of goods from one country to another, ownership of any vehicles is not a necessity. But it is undeniable that the nature of the industry is such that there are needs for financial capabilities and strength, in order to achieve full commitment to customers. It should be understood, that the transportation industry and effective movements of goods are very important, and the role transportation affects the producer, consumer, and in general extend to the whole community. The important role of the transport system in the entire logistics chain is shown in Fig.2.1.
Successful MTS operations need certain commitments to be performed satisfactorily. These include availability of financial requirements, a minimum level of assets, proper insurance, and an international network. Because in this paper the focus is on operations...
in developing countries in general mainly for their imports, and exports, exact figures on costs and quantities, and specific stipulations of operations and infrastructures cannot be definitively incorporated due to limited availability of information, and many variations in economics, and social patterns of developing countries. These differences, such as economic strength, demographic factors, and Geo-political differences lead to classifying them based on certain economic criteria.

In this respect, comprehensive research has been conducted, in order to identify certain requirements for an MTO to exist in a developing country. Because of the diverse natures of these countries, two main elements have been taken into the account, namely 1. Volume of imports and exports, and 2. Income per capita.

The former shows how enormous the transport system could be in a country to handle the volume of exports, and imports. Typically the volume of containerized exports in most developing countries is rather minor relative to the figures for the total exports. This is often because the main portion of exporting goods consists of raw materials. The exception however, is South-East Asian countries, and some Latin American countries. The latter element income per capita, is to demonstrate the relation of GNP to standard of living, which could be used roughly in demonstrating the wealth of a nation. This can eventually be used to identify how much capital investment is required to develop a Multimodal Transport System.

To assist in the evaluation of the diverse circumstances in developing countries, in this work they are divided into three main categories. These are:

a. Small volume of imports/exports, and low income countries, below 500 USD, income per capita.

b. Medium volume of imports/exports, and middle income countries, between 500USD, and 3000USD, income per capita.
large volume of imports/exports, and high income countries, more than 3000USD, income per capita.

There are some exceptions to this classification method. A few countries like; China, India, South-Korea, and some of the South-East Asian countries have volumes of trade that do not match this categorization of income per capita. But as the intention is to make a general assessment of minimum requirements, the above criteria exclusive of the exceptions sufficiently explain such intent. Table 2.1 illustrates the minimum requirements to form a firm, who can operate as an MTO.

<table>
<thead>
<tr>
<th>Imp/Exp.&amp; IPC Requirements</th>
<th>Low Income</th>
<th>Middle Income</th>
<th>High Income</th>
</tr>
</thead>
<tbody>
<tr>
<td>Asset</td>
<td>10% of T/O</td>
<td>15% of T/O</td>
<td>20% of T/O</td>
</tr>
<tr>
<td>Liquidity</td>
<td>5% of T/O</td>
<td>5% of T/O</td>
<td>5% of T/O</td>
</tr>
<tr>
<td>Registration</td>
<td>According to the local law</td>
<td>According to the local law</td>
<td>According to the local law</td>
</tr>
<tr>
<td>Branches</td>
<td>In all trading areas</td>
<td>In all trading areas</td>
<td>In all trading areas</td>
</tr>
<tr>
<td>Warehouse, distribution centre, and CFS</td>
<td>Not required</td>
<td>At least one distribution centre</td>
<td>At least one each near main prod/cons. cnts</td>
</tr>
<tr>
<td>Proper Insurance</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
<tr>
<td>Cargo handling gears</td>
<td>sub-contracting</td>
<td>sub-contracting</td>
<td>sub-contracting</td>
</tr>
<tr>
<td>Min. Annual Turn Over</td>
<td>10,000 US$</td>
<td>20,000 US$</td>
<td>50,000 US$</td>
</tr>
<tr>
<td>Minimum Paid-up capital</td>
<td>Varies</td>
<td>Varies</td>
<td>Varies</td>
</tr>
<tr>
<td>Expertise</td>
<td>Yes</td>
<td>Yes</td>
<td>Yes</td>
</tr>
</tbody>
</table>

KEY: T/O= Annual Turn Over, CFS= Container Freight Station, IPC=Income Per Capita

Table 2.1. Minimum Requirements for Establishing an MTO.

In table 2.1, the values for annual turn over, and percentage of such transactions for assets are based on computation of transport costs for selected developing countries,
according to the classification methods given previously. As mentioned before, the table above does only provide an overall assessment, and by no means can be applied to a specific country because of various reasons, which only then can be evaluated when the country under question is being carefully studied.

The accuracy of these requirements are predominantly embedded in certain criteria such as value added output of the economy, stability in price index and a reasonable inflation rate, exchange rate, economic growth, and many other micro-economics factors, such as cost efficiency of the operator, quality of service, and using economies of scale. All these elements will eventually contribute to the minimum requirements for any service industry to operate in certain country.

So far in international trade mostly liner companies, and international freight forwarders have dominated in the operation of multimodal transport systems. However, due to many constraints, government control, and inadequate financial capabilities, such operational structures simply could not be executed in developing countries. The distribution of scarce resources, provision of capital, pattern of labor forces, and many other reasons give obvious evidence that in developing countries the requirements for forming an MTO should be established according to the economic priority which every country has set-up for its development, and should therefore be considered case by case.

Hence, one of the alternatives to develop an MTS in developing countries, and upgrade the existing system along with an increase in the level of competitiveness, is to employ the “Theory of Infant Industry” which first was introduced by the German economist Fredrich List. This theory simply argues that it should be possible for wise governments to select immature industries and then to guide and protect them until they were sufficiently strong to stand up to international competition. List was most insistent that when this stage had been reached, protection should be removed.1
Thus, there is a need to manipulate the theory of “infant industries” in developing countries. This can be accomplished through a short term government program by preferential treatment and after a while, when the industry has grown enough, it can be left for free competition.

The other approach which seems to be more useful, and without consequential adverse effects on the industry, is to pool the resources together by national control, and establish the capital intensive multimodal system. This can be done also by use of consortia, joint-ventures, and similar systems with foreign investors. However proper care and attention should be given to movement of revenues in foreign currencies, and expenditures in the local market. Also a thorough study on legal, and commercial aspects as well as research on economic effects of such actions must be rendered.

It is possible that any government, private person, corporation or companies can establish a system which can perform integrated transport by arranging the whole international transport of import/export goods in developing countries, by fulfilling the financial and physical requirements which have been mentioned in table 2.1. before in this section.

The following recommendations however could be used as a guideline, which in ascending order, represent the priority of options which any national or private company can choose to form a Multimodal Transport Operating company, if there is lack of financial resources, or technical capabilities. These alternatives are:

1. Extension of services by individual unimodal national carrier, or freight forwarder.
2. Joint-venture established by unimodal national carriers.
3. Joint-venture of national shipping lines, and foreign shipping lines.
4. Joint transport enterprises among developing countries. e.g. between land-locked countries, and neighboring countries where the goods are imported to a land-locked country via that country in-transit.
5. New company established by procedures of major commodities or trade.
6. Joint organization of freight forwarders at a national level.\textsuperscript{2}

It must be mentioned that all these recommendations, and guidelines should be compatible with the local requirements, market demand, law and regulations of any given country, and in addition, thorough studies of such actions, and all their influencing factors should be carried out. Otherwise it can not practically be a successful model.

II.i. NATIONAL INFRASTRUCTURE

One of the key elements in establishing a successful, and competitive integrated transport system in developing countries, is formulation of the pertinent infrastructure. This includes a variety of facilities, starting with port as a water gate and extending to the transport systems to reach to consumption centers through the country. It is important to identify the existing infrastructure, their problems, and bottlenecks, and then try to use, and expand them in an optimum manner.

The issues of utilizing the existing infrastructure, their expansion, development and construction are mainly planning and policy matters, which require thorough and careful study of the respective cases. However, in this section, the primary intention is to examine the minimum infrastructure requirement for development of the MTS in developing countries.

Therefore all possible approaches which could lead to the maximum utilization of infrastructure will be mentioned. Since the focus is on countries of developing economies, these prerequisites are explained within the context of the territory of a nation, even though the goods are imported and exported to and from the country or dispatched from the industrial part of the country, for delivery in consumption centers.
The main infrastructure required for integrated transport includes ports, roads, railways, ICD and CFS, airports, and communication systems.

A. Ports

The port as an interface between sea, and land transportation modes is vitally important in the whole transportation chain. In the planning and development of ports, to facilitate MTS, many aspects should be considered. A port industry is a very capital intensive industry. Without appropriate planning the physical, and monetary out-puts should be seriously limited.

The MTS needed infrastructure and supra-structure for any port are determined mainly by factors like volume of cargo to be handled in port, traffic density, variety of inland transport modes available, distance to main industrial and consumption centers, and natural or artificial size, and kind of port. Table 2.2. presents only the ancillary services which almost every port requires in order to handle various kinds of cargoes.

A multimodal transport system requires a port to be efficient enough to transfer goods in the shortest time from one mode of transportation to another. Therefore, in all cargo handling operations there is a need to employ skillful labor, and effective equipment. In this part however an overall assessment of the infrastructure required for a successful MT operations is being examined.

In addition to these ancillary facilities, a port is also required to have container handling equipment, which depending on the method of handling these requirements are varied. These are illustrated in table 2.3.
Services Requirement

1. Pilotage services
2. Harbour craft
3. Tugs
4. Navigational Aids
5. Rescue services
6. Medical services
7. Dangerous material handling equipment
8. Pollution prevention and clean-up equipment
9. Container, and equipment maintenance area
10. Canteens
11. Recreational facilities
12. Bunkering facilities
13. Port security
14. Water services
16. Repair facilities
17. Quarantine
18. Lighting
19. Communication system
20. Waste disposal
21. Environmental protection, and emergency response plans
22. Fire fighting facilities

Table 2.2. Check list of ancillary services for a port to handle MT cargoes.

In the previous chapter the managerial and operational aspects of such cargo handling systems have been addressed. In the whole transportation chain, the economic function

<table>
<thead>
<tr>
<th>Equipment System</th>
<th>ship/shore handling</th>
<th>Transfer between quayside and storage area</th>
<th>storage area</th>
</tr>
</thead>
<tbody>
<tr>
<td>Trailer storage system</td>
<td>Container crane</td>
<td>Terminal or road tractors and road trailers</td>
<td>Terminal or road tractors and road trailers</td>
</tr>
<tr>
<td>Straddle-carrier System</td>
<td>Container crane</td>
<td>Straddle carriers or terminal tractors and trailers</td>
<td>Straddle carriers</td>
</tr>
<tr>
<td>Gantry-crane System</td>
<td>Container crane</td>
<td>Terminal tractors and trailers</td>
<td>Gantry-crane, terminal tractors and trailers</td>
</tr>
<tr>
<td>Fork-lift truck system</td>
<td>Container crane</td>
<td>Fork-lift trucks or terminal tractors and trailers</td>
<td>Fork-lift trucks</td>
</tr>
</tbody>
</table>

* The ship/shore gantry crane could be replaced by a ship’s crane for all these terminals

Table 2.3. Requirements for handling equipment depending on the system chosen

of a port and allocation of various resources should be set in order to gain the maximum output. The most important of these are

1. Effective and efficient use of existing facilities

43
2. Planning and improvement of services and expansion of facilities

3. Establishing the optimal tariff policy, considering the effects upon the various users, and summarizing such policy for the benefit of all

4. Supporting the domestic shipping and assisting in its development

5. Considering the national interest, encouraging trade in the import and export section

6. Efficient allocation of cargo within a multiport system

7. Efficient allocation of cargo between modes

8. Maximum contribution to the national income

9. Maximizing the total net utility

10. Distributing the income and cost reimbursement

If all these economic objectives are properly set up, and implemented, within the framework of an integrated transport system, the maximum utility of space and equipment can be used.

For a port to handle multimodal cargo which is mainly containerized, it needs to meet certain criteria, and be equipped with certain minimum provisions. These are illustrated in Table 2.4.

It must be noted that utilization of all these requirements varies according to the volume, and type of cargo, as well as to the specific needs of any country. Considering all the
<table>
<thead>
<tr>
<th><strong>Infrastructure</strong></th>
<th><strong>Supra-structure</strong></th>
</tr>
</thead>
<tbody>
<tr>
<td><em>Stacking area, depending on berth to stacking area transfer, and volume of goods for rail and road transportation.</em></td>
<td><em>Computerized information services.</em></td>
</tr>
<tr>
<td><em>Direct delivery/take off plat forms.</em></td>
<td><em>St-ruddle-carriers.</em></td>
</tr>
<tr>
<td><em>Transfer interface.</em></td>
<td><em>Front and/or side loaders.</em></td>
</tr>
<tr>
<td><em>Container Freight Stations (CFS).</em></td>
<td><em>Empty container handling systems.</em></td>
</tr>
<tr>
<td><em>Rail tracks, and internal road ways.</em></td>
<td><em>Tractors, and trailers.</em></td>
</tr>
<tr>
<td><em>Solid berth foundation.</em></td>
<td><em>Transainers.</em></td>
</tr>
<tr>
<td><em>Waste disposal system.</em></td>
<td><em>Gantries.</em></td>
</tr>
<tr>
<td><em>Water and sanitary system.</em></td>
<td><em>Administration buildings, and services.</em></td>
</tr>
<tr>
<td><em>Adequate foundation for heavy loading cargo equipment.</em></td>
<td><em>Repair and maintenance area.</em></td>
</tr>
<tr>
<td><em>Container repair and washing area.</em></td>
<td><em>Fork-lift trucks</em></td>
</tr>
<tr>
<td><em>Trailer storage area.</em></td>
<td><em>Side lift frames for empty containers.</em></td>
</tr>
<tr>
<td><em>Equipment parking area.</em></td>
<td><em>Other ship-shore transfer equipment.</em></td>
</tr>
<tr>
<td><em>Road vehicles parking area.</em></td>
<td></td>
</tr>
<tr>
<td>*Rail marshaling yard.</td>
<td></td>
</tr>
<tr>
<td>dangerous cargo area.</td>
<td></td>
</tr>
</tbody>
</table>

Table 2.4. Infrastructure and Supra-Structure requirements for container terminals

The other determining factors in planning and establishing a port capable of handling multimodal cargoes are:

Soil condition, storage area, terminal transport needs and interface installation. As mentioned before, factors like nature of the port, canal dredging, size of berth to
accommodate various unitized vessels, and other policies which vary from port to port are influencing factors in determining such requirements.

Fig 2.2. A typical schematic diagram of container terminal and its traffic circulation.
The aim in this section was merely to present and demonstrate those possible, and practicable requirements of the MTS in developing countries, with due consideration of limited capital outlay, and lack of access to required technology. All those requirements were illustrated in Table 2.2., which with slight adjustment can be adapted to the needs of any country.

B. Roads

One of the primary prerequisites of a multimodal transport system in any country is maintaining an appropriate road networks. Roads must serve as the connection between focal points, from hub ports to industrial and consumption centers, and from spoke ports to the hub ports, as well as all population centers in the country. As road vehicles are flexible enough to serve even the farthest places in the country, roads play a vital role in the whole transportation and distribution system of the country.

In a multimodal transport system, the fast transit of containerized goods by road is an essential element. Obviously a highway network which is connected to all hub ports, and production and consumption centers can serve such purpose in the best manner. However, in most developing countries such a highway network does not exist, or it is limited to a certain locality. Therefore there is a need to utilize the existing road system to its highest utilization capacity. Although, container movement in certain geographical positions may experience delays, by proper programming this problem can be resolved. In this section, the aim is to show the minimum road infrastructure needed to perform multimodal transport operations.

These requirements are primarily concerned with

1. Capability of connecting all locations inland within the territory of the country.
2. Specific width limit of roads for vehicles, carrying different size of containers.
3. Permissible stacking heights of vehicle.
5. Addressing the issue of safety by establishing required regulations.
6. Maximum permissible gradient. (Function of engine power in relation to the maximum total weight of the vehicle).

These crucial elements are eventually required for carriage of MT cargoes on the road of any country. In through-ways, the width of each road lane must at least be 3.5 meters in order to move containers on the road safely. In addition to the lane, sufficiently wide shoulders should be provided as a refuge for vehicles that have halted so as to ensure the smooth flow of traffic. Table 2.5. shows the infrastructure required for specific axle loads of vehicles in order to maintain the initial quality of the road for long periods of time.

The other important element of road infrastructure is tunnels and overpasses, which for carriage of containers requires height restrictions both on vehicles and containers, plus an operational safety margin. As vehicle heights are not standardized, there is a variety of vehicle heights which according to the different manufacturer and model of vehicles are varied. But loading platforms generally have little height differences. Therefore tunnels and overpasses should have minimum operational margins in order for various type of vehicle to pass under them safely.

It is therefore recommended to use ISO containers to achieve uniformity of container carriage and to avoid complexity of situation with different road networks of importing and exporting countries. The most common used ISO containers have heights of between 8 to 8.5 feet. Consequently the required heights for ISO IA; IB; and IC containers would be 3.88 meters, and for ISO IAA; IBB; and ICC containers 4 Meters, plus a minimum safety margin. In general, a safety margin of 0.3 meters on top of the highest ISO container is a good measurement in order to pass under tunnels and overpasses.
<table>
<thead>
<tr>
<th>Construction elements</th>
<th>All vehicles:</th>
<th>$\leq 800$</th>
<th>$\leq 500$</th>
<th>$\leq 800$</th>
<th>$\leq 500$</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Heavy vehicles:</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td></td>
<td>$\leq 80$</td>
<td>$\leq 500$</td>
<td>$\leq 80$</td>
<td>$\leq 500$</td>
<td></td>
</tr>
</tbody>
</table>

Surfacing (Thickness of different bases, all units in centimeters)

Bituminous pavement
- Top course ................................. 4 4 4 4
- Base course ................................. 0 4 0 4
- Concrete pavement ........................... 15 15 15 15

Base
- Well-graded materials stabilized with bitumen 15 15 15 15
- Sub-base
  - Rock ........................................ 20 20 20 20
  - Gravel, well graded sand .................... 0 0 0 0
- Gravel, poorly graded, or moraine with some organic materials ................... 20 40 5 10
- Gravel, sand or moraine with much organic material .............................. 40 55 25 40
- Silt clay ..................................... 50 65 40 50
- Very soft clay, turf, etc. .................... 60 80 55 60

Table 2.5. Road infrastructure for a 13-ton axle load.\textsuperscript{7}

The relationship between axle load and container carrying capacity is also one of the considerations in determining whether a road can sustain to a specific axle load or not.

Therefore, in design and construction of roads, these elements should be considered. Thus in table 2.6 such relationship is reflected in order to give a better picture of the importance of this element for carriage of containers on the road.
<table>
<thead>
<tr>
<th>Road vehicle type</th>
<th>Axle load (tons)</th>
<th>Tandem Axle load (tons)</th>
<th>Gross weight (tons)</th>
<th>Payload capacity (tons)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Road truck with two axles</td>
<td>8</td>
<td>13</td>
<td>13</td>
<td>7.5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>16</td>
<td>10.5</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>19</td>
<td>13.0</td>
</tr>
<tr>
<td>Road truck with three axles</td>
<td>8</td>
<td>13</td>
<td>18</td>
<td>10.0</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>22</td>
<td>13.5</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>25</td>
<td>16.0</td>
</tr>
<tr>
<td>Truck trailer unit, trailer with two axles</td>
<td>8</td>
<td>13</td>
<td>16a</td>
<td>13.0a</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>20a</td>
<td>17.0a</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>26a</td>
<td>22.5a</td>
</tr>
<tr>
<td>Truck trailer unit, trailer with three axles</td>
<td>8</td>
<td>13</td>
<td>21a</td>
<td>17.5a</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>26a</td>
<td>22.5a</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>32a</td>
<td>28.0a</td>
</tr>
<tr>
<td>Semi-trailer unit with three axles</td>
<td>8</td>
<td>13</td>
<td>21</td>
<td>11.0</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>26</td>
<td>16.0</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>32</td>
<td>21.5</td>
</tr>
<tr>
<td>Semi-trailer unit with five axles</td>
<td>8</td>
<td>13</td>
<td>31</td>
<td>17.5</td>
</tr>
<tr>
<td></td>
<td>10</td>
<td>16</td>
<td>38</td>
<td>24.0</td>
</tr>
<tr>
<td></td>
<td>13</td>
<td>19</td>
<td>44</td>
<td>30.0</td>
</tr>
</tbody>
</table>

Table 2.6. Relationship of axle load and payload capacity

In addition to the above mentioned elements, the auxiliary facilities along the road networks such as repair facilities and road clearing stations must exist for any unpredicted event and to make sure that traffic is flowing smoothly.
C. Railways

Before describing the infrastructure required for railroads, it must be emphasized that the first and foremost problem with the rail networks in most developing countries is the existence of single or one way tracks. This results in heavy traffic, very difficult scheduling, delays in movement of goods and passengers, and unpreventable accidents. Considering that rail transportation has the advantage of using economies of scale, it can be economically very efficient, but such critical problems precludes utilization of the maximum out-put possible from this mode in many developing countries.

Construction of new lines for a two way track system is a rudimentary component of successful integrated transport systems. But, in many developing countries, the required capital is not readily available; therefore it is absolutely essential that before making any investments, thorough studies and investigations should be carried out to determine the potential for mobilizing reserve capacities by the more rational employment of existing facilities.

To be able to carry containers the railway system must maintain minimum physical and organizational standards. To achieve such goals, investment may be required to improve existing infrastructure, and rolling stock, or to create new networks and facilities. Also the optimal use of existing understructure, like reduction of empty wagons, and piggy backs, optimum use of locomotives, precise programming of train timetables, and utilization of maximum permissible loading capacity can improve quality of service and increase the efficiency of the system.

However, an example of using optimum capacity was the introduction of double stack unit trains, which mainly connect the hub Pacific ports of the United States, to Eastern hub centers over long distances. The use of such huge units, and economies of scale is definitely remarkable and amazing, but it cannot be considered compatible with
possibilities in developing countries, at least at the present time. (It cannot even be applied in European countries due to limited heights of tunnels and overpasses). However application of large unit trains of over 60 wagons in many places is a practicable idea.

There is not any specific demand for rail networks to connect all locations within the country, as the road networks primarily serve such purpose. But it should be capable of connecting main, secondary consumption and industrial centers. In the development of such networks, as far as geophysical, and demographic conditions are concerned, the following are of utmost importance: soil condition; area and gradients; number of tunnels; number of bridges; and population, and market demand of certain locations.

Therefore, for railways to carry containerized, and multimodal cargoes, many influencing factors should be considered carefully. These are: compatibility with complementary modes i.e. road transportation for shipment of goods to places where rail does not exist, adequate ground foundation for construction of rail tracks, fast services from/to ports, employing sufficient equipment for container loading/unloading ,and proper investment in construction of new infrastructure as well as upgrading the existing systems.

**D. Inland waterways**

Inland water transportation is one of the most cost efficient inland modes over long distances. Economies of scale and lower investment on infrastructure are possible where natural waterways can be used. It is quite different in nature than ocean transportation due to the relatively short range of operations, and the inland nature of activities. When container carriage and consequently the expansion of inland water way transport is concerned, so investments certain infrastructures are necessary, to meet the demand for such transportation and to attain the optimal out-put from such investment. The primary
infrastructure concerned includes waterways, terminals and interface with complementary modes, and transport bottoms.

The main infrastructure required for inland water transportation, mainly refers to maintaining minimum standards to ensure the permanent navigability of certain size, and type of vessels, regardless of the cargoes carried. Natural waterways provide the most economically viable networks if locks are not interrupting the traffic in the system.

One of the primary problems in using natural waterways is the removal of obstacles, which in developing countries mainly consists of the seasonal variations in the water course, winding routes with sharp curves, instability of river beds, draught restrictions, natural rapids and waterfalls. The minimum requirements for providing and maintaining a waterway to be economically operational for the MTS are as follows:

1. Minimum depth of waterways.
2. Minimum width of waterways.
4. Minimum width of turning area.
5. Navigational aids, and traffic services necessary for safe passage of vessels.

Each of these considerations can act as a limiting factor on the size of operating vessels in the waterways, capacity and volume of traffic, cargo carrying capacities, and the economic efficiency of the entire operation as a portion of total cost of through transport.

Apart from waterways, there is a need for interface infrastructure, which can be in form of a container terminal for complementary modes, i.e. road or (very rarely) rail. The characteristics and requirements of such inland terminals are nearly identical to those of a container terminal in a port which have previously been explained.
E. Inland Clearance Depots (ICD)

One of the main objectives of a multimodal transport system is the door-to-door delivery of goods, within boxes that will not have their seals broken throughout the journey from the consignor to the consignee. To accomplish such objectives a proper distribution and storage area for containers are needed. In order to avoid heavy congestion in the port area, and to keep seals on boxes unbroken an inland clearance depot to serve such purposes can be utilized. This concept can eliminate one of the bottlenecks which can cause substantial delays in ports caused by customs and administrative formalities. By shifting the customs positions to ICDs, the problem of port traffic density can be resolved to a certain extent.

ICDs are normally situated, near consumption centers in order to attain the door-to-door delivery of goods, positioning, and distribution of containers in the most efficient manner. ICDs also serve many other purposes such as enhancing the attractiveness of a region for industrial settlement, permitting consignment to remain unbroken from a place close to the consignor to a place close to the consignee ICDs also have beneficial effects upon the trading and industrial activities of a country or region. The clear example of such activities are auxiliary and support services (gas stations, mechanical repairs, restaurants, markets, etc.) for trailers, trains, and traffic in and out of the ICD.

The other important fact about an ICD is that it is of vital importance to enable land locked countries to relocate port activities away from the foreign coastal transit country placing them in their own countries thereby creating employment for their local population. In addition, the ICD can result in a reduction of total transit time by reducing the handling time, and by providing less cumbersome administration procedures. This eventually will result in reduction of total transportation time and cost, making a country less dependent on the situation in the ports and transportation system of the transit country(ies).
Fig. 2.3. A Typical Multi-Function ICD®
The ICD’s physical requirements are mainly determined by volume of goods to be handled. Therefore the basic prerequisite is availability of land of suitable quality which is dependent on this factor. Also, expansion of depots for future development must be taken into the consideration. There are also some requirements for Container Freight Stations (CFS), which are an integrated part of ICD. Therefore in planning on ICD, the space requirement for CFS as a function of receiving, preparing and handling break-bulk cargoes in containers must also be taken into account.

Space must also be allowed for auxiliary services, maneuvering and running of mobile equipment. Auxiliary services include: provision of parking areas, repair and maintenance of containers, provision of office accommodations and security system requirements. Provisions must also be made for traffic lanes inside of the ICD. With respect to the quality of subsoil, the requirements largely depend on the transfer and storage system, and the axle load of the vehicles which are being used. Fig.2.3. shows a typical ICD with the required facilities.

It can be concluded, that the ICD must basically serve the following functions:

1. Storage of full and empty containers
2. Container control by an interchange system
3. Weighing of containers
4. Collecting/distribution facilities
5. Facilities for minor repairs and container cleaning
6. Loading/discharging of containers for multimodal operations
7. Customs formalities and administrative procedures
8. Facilities for changing of the transport modes
F. Airports

Air transport is a mode of freight transportation that has not yet been recognized for high volume of goods in international trade. However, in recent decades, it gained some importance especially for high value goods, and those which require fast transit, and delivery time. In this context, the growth and development of air freight transportation is mainly dependent on two factors: 1. The Airport and its required facilities, 2. Aircraft technological development, with regard to higher capacity aircraft and more cost efficient planes. There are other various influencing factors which do not have such dominating effects. These, among others, are trained personnel in the terminal, demand for air freight in the specific locality, a population concentration, the airport distance from consumption, or production centers, and frequency and number of aircraft calling at the airport.

In this section the primary intention is to give a brief outlay of what an airport must have to be the primary focal point in air transportation to accomplish delivery, and reception of goods for multimodal transport applications. As such transportation in the whole freight transport chain is developing rapidly and increasing in volume, an airport must facilitate such traffic by having certain minimum infrastructure and supra-structure. These include:

1. Proper foundation of run-way, for axle load of cargo air craft, especially at landing points. This must be calculated, and planned accordingly.
2. Adequate spaces for loading/unloading the containers.
3. Auxiliary facilities for cargo equipment and trucks, in and out of the airport.
4. Ancillary facilities, similar to the port, but with higher sophistication.
5. Interchange system for tracking and tracing of containers, in and out of the airport.
6. Additional security measures because of high value cargoes.
7. Construction for an off-airport cargo site like the CFS and other storage areas in
order to avoid congestion in the airport, as well as to attain efficient receiving/delivery of goods.

8. Off-airport customs and administration offices for prompt and efficient handling of formalities.

These requirements, in addition to the existing facilities for passenger air transportation must be planned and built. However, the most significant element is to build the off-airport cargo site, and the CFS for multimodal transport operations. In spite of the fact that airports normally exist near population centers, the normal availability of rail transport may not be so crucial. Road transportation may be used to sufficiently accomplish the complementary operations.

Hence, in the building of such facilities, the compatibility of the system to surface and air transport must be considered. Also off-airport cargo sites, instead of on-airport sites can eliminate the extra costs associated with the expensive land of airports. The proximity of such terminals is important and advantageous because it is not normally practicable to truck-air containers for long distances.

G. Communication systems

The importance of communication and information technology in the process of multimodal transport operations is undeniable. The flow of information is almost parallel to the flow of goods and must be maintained as quickly and accurately as possible in order to establish a successful economic model for the integrated transport system. Efficient transport of goods, under the Multimodal Transport concept is impossible if the information system does not function properly.

Fig. 2.4. demonstrates the importance of a communication system for the movement of goods.
Fig. 2.4. Importance of a communication system
The information regarding goods, their places of origins and destinations packing requirements, insurance, banks, customs formalities, storage, transportation characteristics, and other consignment information are all required for this complex chain to avoid delays and difficulties. All of the parties involved in trade are affected by a poor communications system. Without an effective communications system, suitable for international trade between various parties, the MTS will eventually fail.

The infrastructure requirement for a communication system includes an appropriate telecommunication network within the country and internationally; facsimile services; telex; electronic mail, and data processing for quick transfer of cargo information. Such communication networks must be strong enough to handle all information without any shortcomings, nuisances, or interruptions on the lines. The use of satellite communications can significantly facilitate such transfer of information.

Therefore, in establishing the MTS, one of the primary requirements and essential elements is a suitable communication network, with wide channels of information to pass all required data to all parties concerned with the transfer of goods from place of origin to destination.

II.iii. COMPUTERIZATION AND DATA PROCESSING IN INTEGRATED TRANSPORT SYSTEM

Computers are a major force of change in the transportation industry, and especially important when the MTS is being used. There is a natural application for computers in MTS, where flow of information between parties is indispensable. The integrated transport system is a network of various modes of transportation which, apart from handling of goods, is characterized by the managing of vast amounts of customer-related information. To handle such information, computers are the best solution, comparing them with only a decade ago, they are less expensive, smaller, faster, and have greatly
increased capacities, which can be used in all developing countries. The use of such systems with suitable technology in developing countries, trained personnel, appropriate planning, proper investment on the hardware and software must be considered in planning for the MTS.

Because the use of various computerized systems such as Electronic Data Interchange, and Electronic Fund Transfer are widely spread around the globe, (but giving all the technical details is not the aim of this paper) only a general overview with particular applicability of these systems in developing countries will be explained. The diagram in Figure 2.5. illustrates the extensive application of such computerized systems in MTS operations. This integrated computerized system shows that the transport industry authorities and various parties involved in reception and delivery of goods can offer customers active monitoring of orders and loading with event-controlled status based on one link.

Electronic Data Interchange (EDI) is a general term that applies to the electronic data linking of firms in the entire channel of procurement or channel of distribution system configuration. It then computerizes and transmits the basic documents that were traditionally processed by hand, or communicated by telephone. The essential functions of EDI are summarized in Table 2.7. Therefore, EDI replaces such hard copy documents and processes as purchase orders, shipping releases, acknowledgments, Bill of Lading, delivery receipt, goods invoices, freight invoices and other related documents to the computerized data messages in the quickest possible time.

Other systems, such as Electronic Fund Transfer (EFT) links the bank with other parties concerned with the contract of sale. It also has a wide range of use in today’s international trade which can be compatible with banking systems in many developing countries for MTS operations. An MTO, as a firm who is between buyer and seller of goods should be involved in such computerized systems because a shipment flow would otherwise be “blind”, both for buyers and sellers. When the MTO is linked with the
system, all the parties in that trade transaction would be notified of the precise movement of goods and their locations at any moment in time. Also, tracing and tracking of container movements can be performed by the use of such a system.

Fig. 2.5. Various uses of the computerized data processing system in MTS

The advantages of computerized systems in MTS are summarized below:

- Reduces paper work
- Eliminates manual data entry

62
• Eliminates postal delays
• Reduces rekeying of information
• Reduces errors
• Cuts down administrative expenses
• Reduces the total business transaction cycle time
• Allows faster and more accurate information flow
• Permits a closer link between various parties
• Make just-in-time system practicable
• Enhances the customer related service
• Facilitates productivity, profitability, and competitive edge of various industries, including producers, and transport operators.

Other advantages of this system include the provision of a common interface for all users, the general monitoring of orders, and the immediate reporting of dangerous cargo lists and packing orders in the shortest possible time. It also integrates all transportation modes with respect to cargo information, notifications, and logistics matters. Today, there are a variety of computerized systems being used in international transportation which can be adapted to the local networks of most developing countries. These include pricing, billing and freight payment by Standard Transportation Commodity Codes (STCC), tariff simplifications by Uniform Cost System (UCS), terminal profitability systems, market intelligence systems, telemarketing, quality measurement systems, and on-board vehicle system.

Computers also hold the answer to facilitation problems in international transportation, such as administration of detailed data inputs, transmission of data for presentation to customs, carriers and consignees. Computers are drastically changing the nature of the transportation industry. The benefits of computer applications indeed increase efficiency, decrease response time, reduce costs, increase revenue, and increase cash
flow all of which are vitally important in progress and development of MTS for the developing countries.

<table>
<thead>
<tr>
<th>Table 2.7. Application and extension of EDI</th>
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<tbody>
<tr>
<td>• Purchaser/traffic manager places order with vendor/carrier.</td>
</tr>
<tr>
<td>• Vendor/carrier acknowledges order.</td>
</tr>
<tr>
<td>• Vendor/carrier acknowledges with information relating to sale or service.</td>
</tr>
<tr>
<td>• Carrier link includes both shipper &amp; buyer.</td>
</tr>
<tr>
<td>• Link involves more than one vendor. More than one seller or buyer.</td>
</tr>
<tr>
<td>• Link enables routine electronic mail to transfer among parties.</td>
</tr>
<tr>
<td>• Link can be used for forecasting and planning</td>
</tr>
</tbody>
</table>

Hence, it is expected that all developing countries who really wish to participate in such activities in international trade must be equipped with some form of computerized system suitable for the needs of the country, and which can be adapted to an international network. The investment requirements for establishing such a system however, is a crucial element which must be planned carefully in order to reap optimum benefit for both the industry and the country itself. Also, there is a clear need for trained personnel so that the system can be utilized in an efficient manner.

In the so called industrialized countries, many MTOs are now foreseeing the day when customer demands for finished products will be quantified in advance. A channel of
information from the final seller to the raw source will facilitate such forecasting. This channel will include the retailer MTO, the wholesaler, or distribution center, other carriers who are sub-contracted under an MT document, factories, and raw material sources. By such computerized systems, intervening measures, communications, as well as cash flows may also be forecasted and proceed in advance.

It is clear that the developing world is lagging behind in information and computerized technology. This means in most developing countries such obstacles of communication need to be resolved in order to plan for an MTS. It must be realized that the cost of both information, and data communication reduce significantly, if instead of ordinary documentation, the computerized systems are used. Hence these computerized systems can be used in positive ways to reduce expenses in the commitment of labor, capital, and energy to transportation. In the transport industry, these facilities need to be utilized in the most effective manner for the benefit of the transportation system.

II.iv. COMPARATIVE ANALYSIS OF DIFFERENT INLAND MODES OF TRANSPORTATION (MTO’S PERSPECTIVE)

For an MTO to carry out a comparative analysis of different inland transportation modes and select the best modes for the inland leg of multimodal transportation, it is necessary first to look at each mode of transport, recognize the main characteristics and then identify in what ways the benefits of these features can be utilized to move products or commodities under the MT system.

The first consideration is to identify the general features, advantages, and disadvantages of all inland modes of transportation. MTO has three options in general, as illustrated in Figure 2.6.
Fig. 2.6. Choices of MTO for inland transportation

These modes of transportation are namely: road, rail, and inland water transport. The general characteristics of each mode are summarized as below:

A. The main characteristics of road transport

1. Flexibility: Owing to its ability to operate door-to-door, road transport has the facilities to move anything almost anywhere.

2. Versatility: The technological advancement in building different kinds of vehicles, and specialized bodies for a multitude of products and commodities, giving the basic road transport vehicle the capacity to carry such diverse commodities. Thus making it highly competitive to other modes.
3. Economy: In comparison with other modes, road transport is competitively priced, particularly as a brought-in service from third party operations. Road operators have frequently had the sharper competitive edge.

4. Infrastructure: One of the main factors which has helped road transport gain the unique competitive position is the development and maintenance of road network by public funds. The exception to this is paid roads, especially highways. Most roads almost in all countries are free of charge to use, which gives a comparative advantage to road operators compared with competing modes.

5. Other factors: In addition to the above, road transport is the only means of transport that any firm can easily own and operate as part of the proper account sector. Notwithstanding of some disadvantages such as high traffic density, which may cause certain delay, inadequate safety and security measures, road transport continues as the most favored means of moving goods and commodities, especially for small volume shipment.

B. The main features of rail transport

1. Capacity: As a means of inland transport, the main advantage of rail transport is its high carrying capacity in terms of both volume and deadweight.

2. Speed: As a perceived advantage of rail transport, speed has a somewhat limited value. When delivery and collective times to and from rail terminals are added, however along with consignment handling times, total elapsed journey times often become much less attractive. Nonetheless, where distances are larger, and in excess of 150 miles (valid for most European countries) and minimum intermediate trains-shipment is required, rail can compete effectively with road transport.
3. Safety and security: As sole system user, railways are in a good position to exploit two particular factors of advantage to system users; safety and security. However rail accidents do occur, sometimes more frequently than desirable. Similar comments apply to security. Although not entirely free from theft and pilferage, rail-based consignments are by physical nature of the rail infrastructure at less risk than the equivalent consignment moving by road.

4. Reduced Delays: In contrast to road transport, rail transport is rarely adversely affected by weather conditions, unless high winds, heavy snow or ice bring down electric catenary wires to the freezing point. Such weather conditions affect diesel locomotives as well.

5. Other factors: The major disadvantage of rail transport is its basic inflexibility. A certain degree of integration, however, may be achieved in the form of cooperation with road hauliers and distribution contractors, with trunk movements undertaken by rail and localized collection/delivery by road operators.

C. The main features of Inland water transport

1. High carrying capacity: Such a factor will of course depend on vessel size and type, but comparatively speaking, water-born transport has the capability to accommodate huge consignments in terms of deadweight, volume, or in many cases both.

2. Economy: Inland water transport provides relatively low unit transport costs for many commodities by using economies of scale. This does mean, however, that the best of such economies are in many cases achieved when vessels carry container cargoes or bulk commodities. Thus inland water transport is economically feasible enough to carry container cargoes for MTS purposes, (of course) where such water system is available.
3. Versatility: In a similar way to the railways, water-borne transport is highly specialized in maximizing its advantage to handle high capacity cargoes.

4. Other Factors: Factors such as: low operating speed, and comparatively larger handling times are elements which give inland water transport some disadvantage.

It should however be emphasized that all these factors are only general features of these modes of transportation. The extent to which any of these elements can influence in the MTO's choice of selecting one of these modes depends upon criteria such as type of cargo and its stowage restriction, its required transit time, freight rate, volume of cargo, volume of traffic, and existing infrastructure in the country where goods are shipped.

Besides the general characteristics of each mode mentioned above, there are other determining factors in choosing an inland transport mode, where there are different options available. The most important of those factors are: 1. cost of transport, and 2. quality of transport.

Because in this paper the focus is on import/export goods, ocean transport is inevitably a part of the transport chain for general cargoes coming into or going out of a country. The air transport usually is used when the value of cargo is either high or urgently needed in a specific market, otherwise ocean transport is the dominating mode in international trade. Thus, air transport may be used for high value goods, courier services, and those products, which have urgent demand in the local market. But the main competing modes for inland transportation are: road, rail, and inland waterways, where water systems exist.

The cost of transportation for different inland transport modes are based on their single operating cost curves, and numerous characteristics such as energy consumption, number of manpower employed, capital tied up to the vehicle, etc. which they individually indicate, according to the nature and place of activities. In this section the
intention is to demonstrate the various cost and quality of service criteria of these modes of transportation in order for an MTO to decide which modes will be more cost efficient. However such judgment can only made compared to the competing modes, and thus shows the general cost indicators of various inland transportation modes. The actual costs calculations vary widely from case to case and from country to country.

In general, the choice of inland mode of transport is based on the relation between cost and distance. For long distances rail and inland water transportation is normally more cost efficient, and for short haulage the road is usually the preferable option, although such a conclusion varies widely from country to country and from region to region, or even from trade to trade. However, an indication of the feasibility of each mode can be given by comparing its cost structure to those of the other main competing modes.

Figure 2.7. illustrates the relationship between distance and cost of transport of competing modes. As mentioned before, it is almost impossible to make a valid general statement on the absolute cost level per unit of transport. Still Fig.2.6. illustrates the normally anticipated relationship between journey distance and costs for the modes of

\[ \text{Fig. 2.7. Relationship of distance to the modal costs}^{12} \]
rail and road. It simply shows the relatively large element of fixed or overhead cost (OF) of rail transport, which for short haulage of containers by rail results in more expensive transportation costs compared with road transportation of the same haulage.

However with increasing distances, the variable cost of rail will increase less than those for road transport. As a result, at D1 a break-even point will be reached beyond which rail transport will have the comparative advantage. If then the transfer cost (FT) of rail is to be considered, this break-even point will shift to distance D2. However, it must be noted that there is not any specific distance figure that reflects this relationship, as it varies greatly from country to country. Some experts believe that road transport can only be a competitor to rail within 100 miles of the port\textsuperscript{13}. But, this distance in the US for example is valid at about 500 miles.

A similar analysis can be made for the relationship between road and waterway transport with slight differences in fixed costs, which varies according to the type and size of vehicle being used. The other factor in the cost calculation of various transport modes is the fuel consumption and energy efficiency of the vehicles being used in these modes. Table 2.8. gives an outlay of such energy consumption for different modes.

In most developing countries fuel as a non-renewable energy source is very vital for the economy, and a substantial amount of foreign currency is normally used for such purposes. This factor, should therefore be calculated accordingly and carefully considered. It is obvious that fuel constitutes a large portion of operating costs for any transport vehicles. However, general estimates stating that cost of unit per ton/kilometer with respect to energy consumption for different vehicles as a proportion of overall costs are not accurate enough to make decision on transport mode. Therefore each individual situation must be calculated with its own criteria, in order to obtain comparative costs for fuel consumption of the different modes.
The figures given in Table 2.8 refer to terminal to terminal transport, and would have to be adjusted to take into account the pick-up, delivery, and transfer operations. Notwithstanding, further adjustments for the specific type and energy efficiency of different vehicles, Table 2.8. reveals a considerable energy saving potential for unit train transport when compared to road transport. Inland waterway transport, where possible is

<table>
<thead>
<tr>
<th></th>
<th>Road</th>
<th>Rail</th>
<th>Inland waterway</th>
</tr>
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<tbody>
<tr>
<td></td>
<td>(80 ton tractor/</td>
<td>(light diesel train)</td>
<td>(vessel of 1500 dwt.</td>
</tr>
<tr>
<td></td>
<td>semi trailer consumption)</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Total gross weight</td>
<td>1000 tones</td>
<td>38 tons</td>
<td>1500 dwt, 90 TEU</td>
</tr>
<tr>
<td>Loaded capacity</td>
<td>Average net load, 25 tons</td>
<td>368 tons</td>
<td></td>
</tr>
<tr>
<td>Consumption</td>
<td>0.58 L/Km Fully loaded</td>
<td>0.30 L/Km empty</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Min. 10.9 cm³</td>
<td>27.2 cm³</td>
<td>10 cm³</td>
</tr>
<tr>
<td></td>
<td>Max. 19.0 cm³</td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

Table 2.8. Energy consumption of road, rail, and inland waterway transport, per net ton-kilometer

Increasingly gaining importance as it is the most cost efficient over long distances. Further environmental problems are relatively smaller compared with other modes. On the basis of the various studies of relative energy efficiency, consumption of three modes can be compared as follows:

Rail Transport being set at 100, thus:

Road transport = 200-400
Rail transport = 100
Inland waterway transport = 80-140
The relative cost of different modes is not a constant factor, but varies according to the number of conditions like: length of haul, type, size, and weight of consignment, condition of infrastructure and traffic density. Provided that alternatives modes are available for specific consignment, it will ultimately be the MTO's choice which mode is used, and what importance is attached to the cost and quality of service, although the cargo owner's choice can influence the MTO's decision in this regard.

However, an exact comparison of transport costs by mode in monetary terms is extremely difficult to make. This is mainly because the infrastructure cost can not be allocated with accuracy to the individual units carried. But there is evidence that with increasing prices of oil-based fuels, and with continuing needs to transport goods greater distances inland, the competitive situation of road versus rail for inland transport will tend to deteriorate.

<table>
<thead>
<tr>
<th></th>
<th>Road (wagon train)</th>
<th>Rail (unit train)</th>
<th>Inland waterway</th>
</tr>
</thead>
<tbody>
<tr>
<td>Speed</td>
<td>+++</td>
<td>+</td>
<td>++</td>
</tr>
<tr>
<td>Door-To-Door</td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>capability</td>
<td>+++</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Reliability</td>
<td>++</td>
<td>+</td>
<td>+++</td>
</tr>
<tr>
<td>Security</td>
<td>++</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Safety</td>
<td>+</td>
<td>++</td>
<td>+++</td>
</tr>
<tr>
<td>Flexibility</td>
<td>+++</td>
<td>-</td>
<td>+</td>
</tr>
<tr>
<td>Availability</td>
<td>+++</td>
<td>++</td>
<td>-</td>
</tr>
<tr>
<td>Energy efficiency</td>
<td>-</td>
<td>+++</td>
<td>+++</td>
</tr>
</tbody>
</table>

Key: +++ High ; ++ Average ; + Low ; - Very low

Table 2.9. Assessment of qualities of service of different modes.15
The other element, which in competitive situations will influence the criteria of modal choice, is the service quality. Apart from the cost factor, any assessment of the economic viability of MTS operations by different modes has to take into consideration the quality of transport services offered. This factor will decisively affect the total distribution cost. Table 2.9. assesses the relative quality of different modes of transportation. These qualitative elements are determining factors, which sometime take precedence over cost factors. The reason for this is that on many occasions the customer needs quality of service even at higher prices. This applies mostly to relatively high value goods.

It should be noted, however, that the evaluation of these qualities is based on the ideal situation, where all the operations are performed efficiently by different operators of these modes. Therefore the situation may not be the same in all countries. If the proper road infrastructure exists in a country, road transportation, especially for short haulage, would be an ideal mode for the MTO, with regard to quality of service. However, the final decision would be based on both cost and quality criteria, in which the MTO must determine accordingly.

It is important to mention that in this section the selection of an inland mode of transport was based on those general characteristics, cost and quality factors. But, there are many other external elements, which easily can influence the MTO's choice of inland transport, such as the economic and social conditions of the country, existence of adequate infrastructure for one mode and lack of required facilities for the other. Therefore MTOs should seek all aspects of various modes of transport, calculate all the relevant costs, and based on the existing situation, and merits of the MT contract decide to choose the best possible inland mode of transport.
NOTES AND REFERENCES:


6. Frankel, p. 185.


Chapter III

INTEGRATED TRANSPORT SYSTEM AND THE DEVELOPING ECONOMY

III.i. GENERAL IMPORTANCE OF THE MULTIMODAL TRANSPORT SYSTEM (macro-economics perspective).

One of the main reasons the MTS was established in most developed countries is its positive impacts on the transport operators' economic efficiency as well as its considerable benefit to the economies of these countries on a macro level. However, other rationale such as cost of labor, technological development in cargo handling systems and transport operations were implied in this context as catalysts, which are also good economic reasons for changing the traditional transport system to the multimodal transport system. The objective of this section is mainly to examine and analyze the overall importance of MTS for the developing economy, without giving any reference to a particular country.

Any modification in transportation systems can significantly affect the economic development of any nation because transportation itself supports fundamental economic
and social activities within the country and outside its territories. It involves the movement of goods and persons to bridge the gap in time and space. In addition to the main economic functions of transportation, an Integrated Transport System (ITS) or an MTS will facilitate trade with other countries by providing an efficient transportation chain, which reduces the total transit time of goods from origin to destination.

In addition to the reduction of total transportation cost, an ITS has many social advantages like: reliability of services, safe arrival of goods, high quality packaging through the effects of containerization, additional security measures by sealed containers, and effective network of cargo delivery through precise scheduling, and integration of various transportation modes. The annual expenditure on foreign transportation varies from 0.01% to 2% of the GNP among developing countries and largely depends on the total volume of a country's foreign trade. If this figure is added to the contribution of the inland transportation, it would reach from 5 to 7% of the GNP, which is a substantial figure in an economic context.¹

The economic theory which can justify the overall importance of an MTS is basically evaluation and determination of the goods' value in a specific market, through the use of an efficient transport system, i.e. when a commodity is demanded in a certain market, only efficient transportation is the bridge to transport this commodity from production center to that market. Thus if the commodity does not arrive at that market at the right time, it does not possess any value for that market. Therefore transportation has a significant impact upon consumption centers, production units, and in general the economic development of developing countries. A very simple model serves to illustrate this point, in Fig 3.1.

Considering that a specific commodity is produced at point A, and costs OC at the point of production, it is desired at a certain price in a consumption center which is situated at location B with distance AB from A. The maximum price the consumer will pay for the commodity is shown on the vertical axis as OE at location B. If the traditional transport
system is used, moving the commodity from A to B will cost CH, the CD portion of the cost line is fixed cost, and the DH portion of the line is cost per kilometer or slope.

Therefore with such traditional transport system the cost at B is OH, a price greater than the maximum cost limit (OE) in location B. Hence if the MTS with an effective use of an integrated system is utilized, the cost per kilometer or slope is reduced and the transportation variable cost line becomes DJ. The cost at the location B is now at OJ, which is below the maximum cost of OE. Therefore the MTS can expand the market to the further locations, in addition to the existing market for the producer. At the same time the cost can be kept below the market price in those locations, allowing either a greater market share to be captured or increased profits for the producer of the goods.

![Graph showing the comparison between a traditional transport system and an integrated transport system. The graph illustrates the cost per distance with fixed and variable costs. The key is labeled: Integrated Transport System (---) and Traditional Transport System (-----). Fig. 3.1. A simple model on landed costs of traditional System & MTS.]

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This reduction in transportation cost will eventually give the commodity "place utility". It means in the traditional transport system, the goods would be sold at higher price in other markets. In contrast by using the ITS, the consumer in other markets far away from the production center in another country can benefit in purchasing goods at lower price. It also gives the opportunity for the producer to gain optimum profit from his products through the creation of more value for the goods by using the MTS.

This virtually encourages different markets to purchase more products from distant suppliers, who might otherwise be produced locally perhaps with lower quality and often at a higher price. (It is to be noted that in this paper the original assumption is that all business transactions are taken place in an Open Economy environment). This ultimately means that developing countries can fabricate goods, and finished products to be sold in other countries at a very competitive price since the comparative advantage of cheap labor exists in most such countries.

The other concept that makes the MTS even more important is giving additional time utility to the goods, i.e. the demand for the commodity during a specific period of time. If a product is at a market in a time when there is no demand for it, then it possesses no value. The MTS creates more efficient time utility by ensuring that products are at the proper location when needed. This gives the seller and buyer of goods a better opportunity to schedule the location of their products, and it gives them a competitive function for the fast distribution of their products, with optimal utilization of their investment on the products.

Additionally, the MTS adds more utility to goods compared with traditional transportation systems. An efficient MTS allows geographic specialization, large-scale production, increased competition, and increased land values. Any nation can specialize in certain commodities with large-scale production in surplus to the local need for export. Such trade transactions can significantly benefit the country because export is considered an engine for economic growth of any nation.
Another important economic consideration of the MTS uses is that it helps to reduce the total expenditure on transportation as a percentage of the GNP. This is accomplished when an efficient system can handle more goods than a traditional system with the same or at lower cost. The volume of goods which can actually be handled using the MTS is greater with the same expenditure compared with the volume in a segmented transport system. Therefore the total expenditure on transportation costs is reduced for the same volume of goods. This consequently contributes to higher productivity of the transportation system.

A study by Arthur D. Little Inc., an economic consulting company, states that much of this decrease in costs is due to the more efficient use and integration of various transportation modes, as well as from less regulation. This is supported by the decrease both in inventory costs as a percentage of the GNP, and logistics costs (warehousing, order entry, packaging, customer services, port handling costs, terminal costs, vehicle operating costs, etc.), which can be decreased significantly with the MTS.

At the same time, however through the use of the MTS the economy should expand more rapidly, productivity should increase, and the better use of the existing transportation system should enable growth to take place without a proportionate increase in freight expenditure.

The MTS can also act as a very strong economic and social tool for any government. Since occasionally in most developing countries there is an urgent need for a specific commodity, and governments need to import that commodity very urgently. Hence the MTS can be very beneficial in fulfilling such demand. In addition transportation of emergency goods to the country after a national disaster requires a very efficient chain of transportation system and logistics planning. The MTS can accommodate such necessities in the most efficient manner. Thus sometime the MTS’s social benefits may precede its economic advantages, which in both cases, it can be beneficial for any nation.
The benefits of a multimodal transport system in terms of its overall economic importance can be summarized as follows:

1. The MTS is pervasive, influencing the business structure in most developed countries, and should be used in countries with developing economies very soon.

2. The MTS allows alternative consumer choice more effectively than a unimodal transport system.

3. Improvement in the MTS can facilitate the economic growth through promoting economies of scale.

4. The MTS increases efficiency, further specialization, and better use of expertise, in a more effective manner for a variety of firms.

5. The MTS can lower the costs of production and increase competition among producers by expanding the area in which a given plant may distribute its products economically.

6. Such increases in efficiency and competition may lead to lower prices and a wider choice of products for consumers.

7. The MTS’s service quality influences the effectiveness of government activities, such as emergency services, importing very urgent products, exporting highly demanded goods, and issues such as the national defense.

8. The MTS can affect the pattern of land use. Because of its efficiency, production units may be located far away from the consumption centers, as there is not any
apparent changes in the overall cost of production by using such efficient transport system.

Although these are positive economic effects of the MTS, they should somehow be weighed against its social costs, and these may vary depending upon existing traditional transportation systems in various countries. But one thing is for sure, many ecological effects, such as air pollution, noise, high consumption of non-renewable energy sources, marine pollution, and other major social costs have the potential to be reduced through careful application of MTS principles.

Hence the MTS, if being utilized efficiently, can spur economic development by allowing more mobility to production factors by permitting scale economies and by increasing efficiency. It can enlarge the area that the consumer and the industry can draw upon for resources and products. Multimodal Transport Systems can expand the international market for developing countries allowing them to sell their products at more competitive prices and participate in international trade more effectively.

III.ii. MTS & INTERNATIONAL TRADE OF DEVELOPING ECONOMIES

The recent structural changes that have taken place in the world economy in general and in international trade in particular are closely correlated with the international transport industry. Since the 1970’s, particularly during the later part of that decade, the traditional structure of the world economy has shifted in a direction that is quite clear: The internationalization of production. The emergence of a global system of production fosters, among other things, an increase in the size of individual firms engaged in production for international trade, certainly an expansion of the spatial scale of their operation.
The development of multi-national corporations, on the one hand, is a significant outcome of such structural changes, but on the other hand, this trend is a major catalyst for the process of production on a global scale.

The development of multi-national corporations is more than just the addition of a foreign subsidiary to the company from one of the developed countries to a developing country. It simply reflects the fact that cheap labor in the developing world encourages corporations to expand to most developing countries. In turn it becomes a complicated, sophisticated, and highly coordinated production utilizing a distribution chain that extends between both the developed and the developing world. Hence the increasing importance of Multimodal Transport Systems as a medium to transfer and move finished and semi-finished products in international trade is apparent.

The economic principle behind such a shift in production locations is basically measured on the comparative advantages of the country in terms of capital intensive, labor and transport costs, with all these factors dependent to a differing degree upon accessibility. It is the aggregate location preference of many multinational corporations that are responsible for the significant recent shifts in international trade. Vertical integration and external economies, which constitute two of the fundamental bases of such large and widespread operations, could not have been achieved without reliable low cost transportation and advanced information systems.4

The globalization of the economy has other connotations as well. It is generally considered to be synonymous with the industrialization of developing countries, the deindustrialization of the developed states, and the expansion of service industries on a global scale. Indeed these three processes directly affect the changing structure of international trade, and the trade balance between countries, and consequently on the transport industry as a whole. Table 3.1., and Fig.3.2 show how these changes affected the containerization of international trade (which led to Multimodal Transport Systems),
and the structural changes in the pattern of export and import of goods within developing countries.

Developed countries, in their search for possible reductions in production costs, have relocated considerable labor intensive production activities to developing countries. The result has proved to increase the developing world's share of the total value of international trade, along with the relative decline of developed countries' share. The growth of industrial production and international trade has been particularly concentrated in the Pacific rim.

In addition to this spatial distribution of international trade, as measured by value, the shift in international directions can be reflected in the volume of finished goods in transit. Container traffic volume can approximate this development and show an increasing share of the volume in the Pacific basin countries. (See Figure 3.2.)

<table>
<thead>
<tr>
<th></th>
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<th></th>
<th></th>
<th></th>
<th></th>
<th></th>
</tr>
</thead>
<tbody>
<tr>
<td>Developing countries(^5) Value (in $U.S.)</td>
<td>Export</td>
<td>14.1</td>
<td>4.8</td>
<td>-3.4</td>
<td>-4.0</td>
<td>20.4</td>
<td>12.5</td>
<td>9.2</td>
<td>8.8</td>
<td>0.9</td>
<td>7.3</td>
<td>11.4</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>14.7</td>
<td>0.5</td>
<td>-1.8</td>
<td>1.6</td>
<td>13.7</td>
<td>17.0</td>
<td>9.3</td>
<td>9.8</td>
<td>3.8</td>
<td>11.5</td>
<td>10.8</td>
<td></td>
</tr>
<tr>
<td>Industrial countries Value (in $US)</td>
<td>Export</td>
<td>11.0</td>
<td>6.5</td>
<td>3.1</td>
<td>16.8</td>
<td>17.0</td>
<td>15.2</td>
<td>7.0</td>
<td>14.9</td>
<td>2.3</td>
<td>6.1</td>
<td>6.9</td>
<td></td>
</tr>
<tr>
<td></td>
<td>Import</td>
<td>11.3</td>
<td>8.6</td>
<td>2.7</td>
<td>13.2</td>
<td>18.2</td>
<td>13.8</td>
<td>8.4</td>
<td>14.5</td>
<td>0.6</td>
<td>5.7</td>
<td>7.1</td>
<td></td>
</tr>
</tbody>
</table>

Table 3.1. Annual changes in the value of exports and imports in all regions\(^6\)

Only a Multimodal Transport System is well suited to cope with these dramatic changes in world trade. It allows the economic efficiency of production units to be maximized in
many locations in a variety of countries, as well as providing consumers with a choice in competing products at lower prices when purchasing necessary goods. It can be observed that the MTS is an important factor for opening a new market, and for expanding exports, which lead to economic growth. Still emphasis must be placed on a variety of other factors, including pattern of investment, and flow of liquidity, which are addressed later in this chapter.

It is also interesting to examine the MTS in view of the rapidly changing patterns of traded commodities. Table 3.2. illustrates which goods are being internationally traded. It shows that world trade of manufactured goods which can use the MTS rose by about 30% from 1955 to 1990. It proves the increasing magnitude of demand for container operations, which consequently requires an MTS.

![Fig.3.2. Volume of container traffic in three main regions of the world](image)

Table 3.2. distinguishes between primary commodities (agricultural commodities, minerals, and fuels), and manufactured and processed commodities.

Another important factor which should be considered is the comparison between these emerging changes in international trade and the participation of developing countries in
Multimodal Transport Systems. With the few exceptions in South-East Asian countries,

<table>
<thead>
<tr>
<th>% Share of</th>
<th>1955</th>
<th>1990</th>
</tr>
</thead>
<tbody>
<tr>
<td>Primary Commodities:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Food, agricultural goods</td>
<td>22.3</td>
<td>12.5</td>
</tr>
<tr>
<td>Fuel</td>
<td>24.4</td>
<td>14.0</td>
</tr>
<tr>
<td>Minerals</td>
<td>3.8</td>
<td>3.5</td>
</tr>
<tr>
<td>Manufactures:</td>
<td></td>
<td></td>
</tr>
<tr>
<td>Road Vehicles</td>
<td>13.6</td>
<td>19.0</td>
</tr>
<tr>
<td>Engineering Goods</td>
<td>29.9</td>
<td>39.5</td>
</tr>
<tr>
<td>Textile &amp; Clothing</td>
<td>6.0</td>
<td>11.5</td>
</tr>
</tbody>
</table>

Table 3.2. The composition of World Exports

other developing countries do not have any major role in such operations. Table 3.3. shows the major players in international multimodal transport systems. It is apparent that most of them are either owned in industrial countries or linked to corporations in industrial countries. It basically reflects the 15 top container operators in the world based on their volume of goods handled, which in most cases provide door-to-door delivery.

The list comprises the names of the original shipping lines even though most of them now are acting as VO-MTOs (Vehicle Operating Multimodal Transport Operators). The figures represent the number of containers which are handled on their major shipping route. To this list other operators which are primarily courier companies, like the UPS, and the DHL, should be added. The list in table 3.3. represents 55% of the world’s total container capacity. Leading operators in terms of TEU-shares are Maersk(7.2%), Evergreen (7.2%), and Sea-Land (6.7%). An important point to note is that if developing
countries understand the significant impact of MTS on their economy, there is a possibility for them to participate in this business, which can benefit them tremendously.

<table>
<thead>
<tr>
<th>Operator</th>
<th>1000 TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>MAERSK</td>
<td>114.4</td>
</tr>
<tr>
<td>EVERGREEN</td>
<td>114.1</td>
</tr>
<tr>
<td>SEA-LAND</td>
<td>107.3</td>
</tr>
<tr>
<td>NYK-NIPPON YUSEN KAISAH</td>
<td>83.3</td>
</tr>
<tr>
<td>MOL-MITSUI-OSK Lines</td>
<td>62.8</td>
</tr>
<tr>
<td>APL-American President Lines</td>
<td>58.4</td>
</tr>
<tr>
<td>P &amp; OCL- P&amp;O Container Ltd.</td>
<td>58.1</td>
</tr>
<tr>
<td>HAPAG-LLOYD</td>
<td>57.0</td>
</tr>
<tr>
<td>HANJIN</td>
<td>56.9</td>
</tr>
<tr>
<td>YANGMING</td>
<td>56.8</td>
</tr>
<tr>
<td>OOCL</td>
<td>51.2</td>
</tr>
<tr>
<td>NEDLLOYD</td>
<td>50.9</td>
</tr>
<tr>
<td>K-Line</td>
<td>48.8</td>
</tr>
<tr>
<td>ZIM</td>
<td>41.8</td>
</tr>
<tr>
<td>NOL-Neptun Orient Lines</td>
<td>37.8</td>
</tr>
</tbody>
</table>

Table 3.3. 15 Top Ranking Container Operators

Therefore, since the pattern of the world trade is changing, due to the existence of cheap labor in developing countries, it is wise for these countries to pay attention to this service industry which can facilitate their processes of production. The MTS, as the best alternative in connecting various locations, and in transferring goods in the shortest transit times should be considered as an issue of priority.

Since economic development and transportation are closely linked, and as transportation is not only determinant of economic development, but a decisive factor, it should be planned very accurately. Also the intimate relationship between the existence of a transport system and economic development is not a one way relationship, transport influences economic development, but at the same time, it is influenced by it.
Nevertheless, it can be generally be said that, the structure and the speed of development of a national economy are largely dependent upon the extent, and even more so upon the quality of the transport system. It is here that the MTS can provide the right answer when planning for a transportation system that will positively contribute to the economic growth of a region or a country.

International trade is the primary factor in economic growth of any nation. It is one of the decisive elements for stimulating industrialization and the growth of local markets for goods and services. Furthermore, trade fosters the development of advanced agricultural systems and techniques, and increases the speed of development. For any nation to engage in such international trade, there is a demand to be equipped with a strong transportation system. A traditional and generally inefficient transport system is not the right choice for significant future developments. In particular, developing nations need to upgrade their existing transport system, and become compatible with the rapid changes taking place in international trade by utilizing an Integrated Transport System (or an MTS). It can provide them with access to other markets and allow them to enjoy greater economic development through increased exports, and more wealth for their nation.

Fig3.3. Comparative Real GDP Growth 1980-1989¹⁰
Fig. 3.3. illustrates the GDP growth of various countries, in which low income developing countries have the highest growth. This suggests a rapid and continuous demand for proper transportation systems in developing countries.

The economic factors which have been explained above are justified commercial and economic reasons for establishing a multimodal transport system in a developing country. However, it should be noted that the real initiative for giant firms in developed countries were basically an ever increasing costs of labor, which led them to find ways and means for cutting the operational costs, as well as to increase their level of competitiveness. Another basic reason for development of MTSs in the developed world was the technological development and containerization, which could reduce the operational costs dramatically, and at the same time use economies of scale and provide efficient and fast operations.

Therefore, the need to increase productivity of labor called for a capital intensive transport industry, in which quantitative labor was minimized. Thus, the primary intention to develop an MTS for any developing country should not be the same as those of developed countries. In contrast, the MTS should be utilized in the benefit of economic development. On this route, some economic factors may be employed which are suitable to the needs of a country under question, and there might not be a need to reduce the level of employment, as most developing countries have the comparative advantage of using a competitive labor force.

The average annual population growth for developing countries is now about 2.5%. This means continuing need for greater levels of employment, suggesting a continuing comparative advantage of the existing labor force. High labor costs in developed countries should continue to benefited developing countries, through greater employment levels and large production volumes. While the MTS will tend to decrease employment in the transport sector, an offsetting increase in the auxiliary transport sector of the industry can be anticipated. This will be explained further in this chapter.
The technological changes in the transportation industry will bring about a process of capital/labor substitution, and will also increase the efficiency, and speed of transport, mainly by speeding up the handling operation at ports, through use of effective cargo handling systems. This will be accomplished through greatly reduced times in packaging/unpacking, and by reducing the handling process at all transfer points. The large capital outlay required for an MTO to offer such services, will necessitate organizational changes, which in turn will modify the pattern of economic elements in the whole transportation and distribution system.

In order to finance such a capital intensive system, and in order to rationalize services efficiently, joint operations with foreign investors, with equal control over the finance, operation and pattern of liquidity movement, and banking cash flow would be advisable. If such a joint program can be discreetly and wisely planned, it can certainly have a positive effect on the capital account of the country. This however, will be spelled out later in this chapter.

Another advantage of the MTS is related to the economic integration of different states, who share common economic interests. The use of the MTS, particularly in developing countries, contributes decisively to their integration into the world economy by providing a part of an efficient global network of transportation. However, the competitive situation of the world trade must be studied prudently in order to establish such link. Such integration definitely attributes to the strength of these countries' foreign trade, where cooperative transport system virtually holds larger volumes of goods for handling, and therefore reducing the marginal costs, and using economies of scale, which is ultimately beneficial for economic development of all countries involved in such integration.

As shown before, at present MTOs in developed countries are dominating the international multimodal transport system. This eventually gives developing countries less opportunity to participate in international transportation of goods. It also offset their trade
with other countries, as they are compelled to incur their transportation costs by foreign currencies.

An urgent need therefore is felt to find ways and means of increasing the participation of indigenous MTOs in developing countries in this trade and protecting the economic needs and interest of these countries. Developing countries should be aware of the fact that today, the MTS is an undeniable element of international trade, and if they want to be alive in such environment, they should be equipped with such instrument imperatively, and urgently. This virtually protects both their economic interests, and provides them with controlling tools in trade with other countries to the extent that they can establish most terms of trade by themselves, instead of dictating all these terms by their developed counterpart country.

III.iii. FOREIGN EXCHANGE EARNINGS AND BALANCE OF PAYMENTS

One of the main difficulties in developing economies is the problem of hard currency and inadequate foreign exchange earnings. It appears that there is a heavy imbalance in the export and import of goods and services in most developing countries, which has a negative impact on national accounting. This section examine whether there can be an additional contribution to the balance of payments, through the use of a multimodal transport system. This is mainly accomplished by showing that an MTS has more positive impact on the balance of payments compared with traditional transport systems. (Mainly shipping and aviation as modes of transportation contribute to the invisible portion of balance of payments). Table 3.4 reflects a very basic and simple model of the manner in which the balance of payments is calculated. Each balance shown in this table is the cumulative sum of the balances above it.
Before analyzing the impact of the MTS, it is necessary to comprehend that the MTS is the transportation system which involves the seamless movements of goods, based on door-to-door delivery of products, arranged by one operator. Therefore there are no additional modes of transport, or process involved in such operations, the only difference is the method in which the transportation is carried out. Thus the differences in employing various elements in total transportation of goods which makes the MTS different from ordinary transport systems. The only differences with a traditional transport system are the reduced total transit time, the elimination of unnecessary delays, the reduced documentation, and the uniform liability regimes.

The potential for a positive impact upon the foreign sector of economy lies in the differences in operational, contractual, and commercial practices compared to traditional transport systems.

<table>
<thead>
<tr>
<th>Total Receipts</th>
<th>Total Payments</th>
<th>Balance of Payments</th>
</tr>
</thead>
<tbody>
<tr>
<td>minus (-)</td>
<td>equals (=)</td>
<td></td>
</tr>
</tbody>
</table>

- Merchandise Export
- Service Exports
- Transfer payments e.g.: Residents working abroad
- Capital inflows, e.g.: Investment
- Government borrowing
- Long-term private borrowing
- Sales of Reserves
- Merchandise Import
- Service Imports
- Transfer payments
- Other countries’ residents working in the country.
- Capital Outflows, e.g.: Investment
- Government debt payments
- Long-term private debt payments
- Purchase of Reserves

<table>
<thead>
<tr>
<th>Balance of Trade (visible)</th>
</tr>
</thead>
<tbody>
<tr>
<td>Balance of goods and services (invisible)</td>
</tr>
<tr>
<td>Balance on Current Account</td>
</tr>
<tr>
<td>Basic Balance</td>
</tr>
<tr>
<td>Official settlements Balance</td>
</tr>
</tbody>
</table>

Table 3.4. Component Factors of a National’s Balance of Payments

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The current freight payment of developing countries in international trade contribute considerably to the existing imbalance in the balance of trade and invisible, and thus to the debt problem of many developing countries. One of the primary solutions to remedy the existing situation is to promote the export services of the transportation industry. A competitive national MTO might be the right answer, if planned mindfully.

However when evaluating the potential contribution of a national MTO to the balance of payments, some other factors should be considered. For example, the total freight paid to the MTO in the country’s foreign trade represents a gross freight exchange savings (earnings), the net effect on the balance of payments will be considerably less, due to the outflow of foreign exchange in purchasing vehicles. Also purchase of equipment for the industry. In addition, due to investment in facilities which require purchase of material from outside the country, and due to payments to operate vessels and vehicles outside of the country. Consequently, the net foreign exchange effect of an investment on this sector will vary largely from country to country.

In fact the contribution of the MTS to the balance of payments depends on the ability of national industries to build equipment for the industry, trade policies, efficiency of operators, and other fiscal and monetary policies which government may choose to use in the event of other governments’ intervention in their trade. Table 3.5 shows the main equation for a balance of payment and tools which can be used to balance such equation. Since transportation affects the invisible earnings (savings) on the balance of a current account, any freight or purchase in foreign currencies for transports services enters as debit and any earnings (saving) on these services enter as a credit in this portion of the balance of payments.

As mentioned in the previous section, the rapid changes in the pattern of world trade are causing increases in production and consumption as well as an uneven distribution of these activities. This in turn has resulted in expansion of trade in services. From a theoretical point of view, trade in services can be analyzed with the same tools as trade in
(Government Budget Surplus + Private Budget Surplus) =
(T - G) + (S_t - I_P)
(Foreign Exchange receipts - Foreign Exchange Expenditures)
(X + NTR) - (M + NFP)

If there is an inbalance between receipts and payments, the result of such equation may be:
(Increase or decrease in net foreign assets)
Δ NFA

Where: T = Government revenues, G = Government expenditure, S_t = Government Savings
I_P = Private Investment, X = Export, NTR = Net Unrequited Transfer, M = Import
NFP = Net factor Payment, ΔNFA = Increase or decrease in a country's net foreign assets position.

Policy Instruments:

<table>
<thead>
<tr>
<th>Expenditure-changing policies</th>
<th>Expenditure-switching policies</th>
<th>Financial policies</th>
</tr>
</thead>
<tbody>
<tr>
<td>Fiscal policies</td>
<td>Trade policies</td>
<td>capital controls</td>
</tr>
<tr>
<td>Monetary policies</td>
<td>Exchange rate policies</td>
<td>Debt policies</td>
</tr>
</tbody>
</table>

Table 3.5. Basic National Accounting, and policy instruments

goods. The international services trade, with transportation being part of it, is driven by the same principle of comparative advantage as generates trade in goods.

Nevertheless, there are limitations on trade in services which do not apply in the same way and to the same extent as for physical products. A large part of the service sector is confined to the domestic market. Adam Smith’s definition of services, that, “they are consumed in the instant of their performance”, means that many are directly tied to a specific location. However, the multimodal transport system is partly exempted from this definition, as it is closely linked to the movement of produced goods, and it therefore has the mobility of crossing between borders, and consequently affects the foreign sector of the economy.

Foreign earnings (savings) from transportation services provide a source of revenue on the current account. This traditionally has been made up largely by shipping services, or
air transport services, but by using the MTS it can be expanded to the other modes of transportation. This is especially important when there is a surplus of revenue over expenditure in foreign currencies for hiring sub-contractors for inland transportation in other countries. Besides a direct investment in transportation, there are a few other ways in which transportation can affect the balance of payments. These are:

1. Freight revenues received by a nation’s transporters or the carriage of a country’s exports to international markets.

2. Freight revenues from cross-trading between other countries for transporting their goods.

3. Receipts from the hiring of vehicles and other transport equipment by foreign operators.

4. Disbursement made in the country by foreign operators. (fuel, repair, equipment, provisions, etc.)

5. Freight payments made to foreign operators for the carriage of import.

6. Payments for hiring of foreign vehicles or equipment.

7. Disbursements made abroad by national transport operators.

It is clear that some of these factors can not be affected very much by using the MTS instead of a traditional transport system. But some of them, such as using efficient MTS to reduce the amount of freight payment to foreign operators; and, earning profit in foreign currency in inland transport of the country of export/import other than one’s own country; and, also through employing an efficient system that fosters profitable cross-trading operations.
Since transportation in general, and the MTS in particular embraces positive effects on the balance of payments, thus most developing countries need to utilize such transport system in optimal benefits for their respective countries. This is especially important in low income countries, where a single foreign exchange transaction may create deficit in the total balance of payments transactions. Because the balance of trade account encounters the largest effect on the balance of payments, hence, the importance and vitality of such efficient transport system are essential to have a healthier balance of payments.

In analyzing the additional effect of the MTS over the traditional transportation system on the balance of payments, there are two main considerations. This involves first, invisible transportation services, and second, capital transaction accounts, although MTS may have some effects upon transfer payments by employees of national work forces in other countries. (seafarers working in foreign companies; truck drivers; ordinary and skilled labor in air industry; etc.).

iii.1. Effects on Services transactions

The MTS as an efficient transporter of goods by various modes is highly flexible. Through its international network of carriers and sub-contractors, it provides a primary option in international trade for movement of export/import goods.

In the following model to different effects of the MTS over a traditional transport system will be examined. The primary assumption is that the economics environment examined is within an open economy, and basically all the businesses are in competition. Therefore the driving factor in choosing the operator for moving import/export goods is cost efficiency and quality of service. A very simple example can clarify the additional contribution of the MTS to the balance of payments.
It is assumed that there is a shipment of manufactured goods, which can be fitted into a container. If an ordinary transport system is being employed, the total cost of moving this container from a manufactured unit in developed country A to the buyer’s premises in developing country B, would be about 3500 equivalent US dollars. For the purpose of simplicity, and avoiding complication, it is presumed that all transport costs are the responsibility of the buyer, in country B, which has to incur all these costs. The buyer will then receive an offer from an efficient MTO in country B, with lower rate than transport operators in country A. This MTO can transport this container on a door-to-door basis for total freight paid of 3000 equivalent US dollars, with comparative advantage of adequate local knowledge. Eventually the MTO acquires the contract, and transports the goods. The MTO’s offer with lower freight is basically possible because of its efficient transport network, using economies of scale, and reduction in operating costs.

<table>
<thead>
<tr>
<th>Impact on BOP</th>
<th>Traditional Cost structure</th>
<th>MTO Cost structure</th>
<th>Impact on BOP</th>
</tr>
</thead>
<tbody>
<tr>
<td>Negative</td>
<td>70 Fx Packing and pick-up</td>
<td>50 Fx</td>
<td>Negative(-)</td>
</tr>
<tr>
<td>Negative</td>
<td>500 Fx Inland Transportation Country A</td>
<td>400 Fx</td>
<td>Negative (-)</td>
</tr>
<tr>
<td>Negative</td>
<td>150 Fx Port &amp; handling charges “A”</td>
<td>100 Fx</td>
<td>Negative (-)</td>
</tr>
<tr>
<td>Saving</td>
<td>1800 Lx Sea transport (national carrier)</td>
<td>1500 Lx</td>
<td>Saving (+)</td>
</tr>
<tr>
<td>Saving</td>
<td>120 Lx Port charges country B</td>
<td>80 Lx</td>
<td>Saving (+)</td>
</tr>
<tr>
<td>Saving</td>
<td>500 Lx Inland transportation country”B”</td>
<td>350 Lx</td>
<td>Saving (+)</td>
</tr>
<tr>
<td>Saving</td>
<td>100 Lx Delivery charges</td>
<td>50 Lx</td>
<td>Saving (+)</td>
</tr>
<tr>
<td>Saving</td>
<td>120 Lx Administrative and documentation</td>
<td>70 Lx</td>
<td>Saving (+)</td>
</tr>
<tr>
<td>Negative</td>
<td>140 Fx Agencies, an other administrative</td>
<td>50 Fx</td>
<td>Negative (-)</td>
</tr>
<tr>
<td></td>
<td>860 Fx Total costs</td>
<td>600 Fx</td>
<td></td>
</tr>
<tr>
<td></td>
<td>2640 Lx</td>
<td>2060 Lx</td>
<td></td>
</tr>
</tbody>
</table>

Total Foreign Exchange saving : 260 US$
Total saving on transport costs : 500 US$

Key : Fx = Foreign currency.
Lx = Local currency.

Table 3.6. Comparison of Cost structure for carrying a TEU Import
The expenditure structure of all payments are illustrated in table 3.6. Note that the additional costs of a traditional transport system compared with the MTS is basically due to the sufficient flow of goods provided by the MTO. A shipper may not have such accessibility. Therefore all segmented operators offer higher freight rate and charges, compared with the MTO's offer.

The MTO will eventually spend some payments on foreign currencies, and some in local currencies. But the total payment and resulting profit are saving some foreign currencies compared with a traditional transport system. This provides the justification for the MTS additional contribution to the balance of payments, partially due to saving hard currencies, and some earnings of foreign exchange when MT document payments are based on foreign currency rates.

Real life examples are usually more complex, with many other factors involved, such as terms of trade, import/export restrictions, preferential treatment of national carriers, different uses of Incoterms, and various barriers which exist, in world trade. But, it can confidently be stated that the use of the MTS instead of a traditional segmented transport system will contribute more positively to the balance of payments. Even if developing countries do not have the resources, and adequate capital to invest in such transportation systems, they are compelled to buy such services for their trade. The use of the MTS can benefit their balance of payments due to a smaller total freight payment in foreign exchange and consequently a saving of the foreign currencies.

The use of the MTS in imports of goods to developing countries is more cost efficient and therefore lesser foreign exchange is paid for transportation. This results in a positive effect on the balance of payments. Depending upon the terms of trade the extent of such positive effects are varied for exports of goods, but certainly the use of the MTS instead of a traditional transport system is beneficial for foreign currency difficulties in developing countries.
iii.2. Capital Transaction Account

As explained before, the MTS is one of the elements for any country to expand its market, and access international trade more pragmatically and in a more effective manner. This ultimately results in encouraging foreign investment to flow into the country. This inflow will be entered in the credit section of the capital transaction account. An efficient transportation system can serve as a propulsion power in an economy by initiating a demand for greater production quantities for export, and by giving more options to producers of goods to expand their market.

The potential for a positive benefit is real and can be simply stated, but the reality of effecting the benefit is more complex. But, the distinct effect of the MTS here, is to speed up the process of foreign investment, and act as a catalyzing element to give the opportunity for foreign investment in developing countries. The foreign investment can be placed directly within the transportation sector, or indirectly in other production or service industries. But a primary initiator of the investment is the presence of an efficient multimodal transport system.

A simple example can demonstrate this point more clearly. Considering a giant international firm that is looking for investment in a developing country, with the comparative advantage of a cheap labor force. A developing country which has such advantage, and is seeking such opportunity may try to attract that firm. But, due to lack of an adequate transportation and communication infrastructure, such investment is impracticable. The company requires an efficient transportation and logistics system which can handle movements of raw materials and produced goods on a very precisely scheduled basis. It becomes obvious that the use of the MTS and the infrastructure to utilize it, is a prerequisite to attract any foreign investment.
A crucial factor which must be considered carefully, and integrated within the MTS is the pattern of foreign currency movement, in and out of the country in such investments. These can be controlled by proper exchange mechanisms and financial regimes within the country, and with agreement with foreign firms, investing in the country. But they are essential to the success of the MTS and its benefit of attracting foreign investment.

An overview of foreign investment in Pacific basin countries, in China, and in some Latin American countries shows that such capital investments have positively contributed to the balance of payments in those countries. 12

The contribution of the MTS to the capital transaction account may not necessarily be a direct effect, but it is one of the factors needed to initiate such foreign investment in the country. There are of course various other political and economic factors which influence such transactions, but the role of the MTS as a complementary factor cannot be denied.

III.iv. OTHER ECONOMIC BENEFITS OF THE MTS

The mutual relationship between multimodal transportation systems and world trade is so complex that comprehensive listing of the different economic impacts of the MTS on the macro-economy is almost impossible. It is a particularly difficult task when a general statement that can encompass all developing countries is attempted. However this chapter has attempted to highlight the main issues of particular interest to countries with developing economies.

Transportation, and specifically multimodal transport systems are closely linked to international trade. Thus, any benefit which arises from the country’s foreign trade will affect the transportation industry of that country, or its trading partner(s). Since the
1970’s developing countries have begun to produce a diverse range of manufactured products at competitive prices, applying a more acute pressure upon the world market; and since the number and types of manufactured exports of developing countries have increased, this has enabled a number of low income countries to become middle income nations. The MTS can play a vital role in the further expansion of their markets and the economic development in these countries.

Fig 3.4 shows the world trade import growth. The special notion in this figure which is important regarding development of the MTS in developing countries is that increasing imports suggest greater foreign exchange losses and increasing losses through transportation costs. There is a growing need for proper transport systems to meet the demand for such trade and economic growth in today's world and as well for future expansion of developing countries' economies.

There is also a high demand for connecting the world by efficient transportation systems as the pattern of world trade is beginning to change again due to recent political changes in the former eastern bloc countries. However, the extent to which any political decision can influence the commercial practices is dependent upon political and social system of the respective countries. Thus multimodal transport companies as commercial entities are subjected to influential political decisions. But, in an open economy the economic elements are driving factors in an efficient operations of the MTS.

Fig 3.5 illustrates the main factors which can influence the efficiency, expansion, and success of the MTS in any developing country. These factors are the main decisive elements that they can influence in an efficient operation of MTS. However the extent to which these factors can influence an MTS varies. They must be judged case by case.

In general, three main macro-economic factors are influenced by the MTS. These are

1. The contribution of the MTS to the GNP, and economic growth.
2. The contribution, direct or indirect of the MTS to the pattern of employment.

3. The influence of the MTS on investment in main or auxiliary service industries, and the derived effect due to the supplies of services to these auxiliary industries.

![Graph: Engines Of Trade](image)

**Fig3.4. Annual Growth of Imports from the World**

Their significance on the macro-economy is such that they affect almost all parts of peoples lives in any society. These factors can be affected by the MTS to a varying extent depending on the economic orientation of the country i.e., industrial based economy, or agricultural based economy.

The MTS may have other effects on the macro-economy of any country. But these are high priority issues, which must be planned and addressed carefully, in the development of the multimodal transport systems in countries which face trade and economic growth. The effects can vary from country to country, and the contribution of the MTS mainly depends on the importance of transportation to these issues in a national context.
iv.1. Contribution to the GNP

Basically, determination of the exact contribution of the MTS should be calculated for the sum of expenditures of various national transport users, which have used the MTS for the transport of their products. Since the MTS can handle more cargo than traditional transport systems due to its efficiency, thus it might be expected that the total volume of cargoes handled by the MTS in specific period of time, is more than the volume of goods transported by a traditional transport system.

Fig.3.5. Factors affecting Multimodal Transport Movement
With more volume of goods transported by the MTS, therefore more economic transactions have taken place in the country which means economic growth and increases in the GNP. This statement is also correct when foreign trade as part of the GNP is grown through the use of the MTS.

A positive contribution would derive from the fact, that more volume of cargoes, and thereby greater value of goods can be moved in a certain period of time compared to a traditional system. If the volume of cargo remains constant even by using the MTS, which often is not the case, there will be a decreasing expenditure on transport costs, due to the MTS cost efficiency, and therefore lesser contribution to the GNP. Although it should be noted that even such effect is not a bad thing because it may allow the firms to invest in other production lines by using their saving on transport costs.

Therefore, in certain cases where the value of goods moved by the MTS compared to a traditional transport system remains constant, the percentage of the transportation contribution to the GNP may decrease. But, if due to an efficient transport system ,the value of goods moved increases, which is often the case, the total percentage of the MTS contribution to the GNP will be increased.

Fig.3.6. shows the GDP growth of developing countries compared to developed nations. This increasing growth in GDP demonstrates that the total contribution of the transport system must be contributing increasingly to the GNP because expansion of industrial out-put requires enlargement of the transport system capacity for domestic movement of goods, as well as for international trade.
Fig 3.6. Comparison between Real GDP growth changes of developing and developed countries

Therefore, contribution of the MTS to the GNP can be measured by the contribution of each mode to the GNP, which is value added output plus air, sea, road, and rail transport contributions respectively. However, this measurement can include communication as well, because of its inter-related dependence on the transportation system. The use of the MTS gives a sharper competitive edge to the industry, which results a benefit for the total economy because it gives the customer additional purchasing power due to consumer product availability at lower costs. This is mainly due to the fact that cost of transportation as a portion of the total price of goods can affect the finished prices in consumption centers. Therefore, reduction in transportation cost will reduce the price of goods, and thus increase the purchasing power of the customer.

The MTS also acts as a catalyst for economic growth of the country through its efficiency by creating accessibility to new markets for production firms both domestically, and internationally. Thus, due to increasing importance of semi-finished and intermediate products in international trade, which can eventually be containerized, it is predicted that in most developing countries, the value of goods to be transported
together with the value of transportation expenditure, will result in expanding the MTSs, and their contribution to the GNP of these countries.

iv.2. Contribution to the Employment Pattern of Developing Countries

Similar to other industries, employment in the transportation sector constitutes one of the most sensitive macro-economics issues to be considered. New technological advancements, and invention of better cargo handling gear, vehicle operations, and new methods of moving cargoes in multimodal transport systems result in a reduction of required labor force size, especially in port related activities. Thus, if this concept is looked at from a micro point of view, it is a very cost efficient system. Basically investment in technology has resulted in huge cost-savings in labor, which constituted between 26 and 78% of the total transportation costs.\(^1\)

However from a macro point of view the MTS has a negative effect on employment patterns in the transportation sector due to increasing unemployment in this sector. But one thing should be considered, and that is that the MTS did not affect the employment statistics in rail and road transportation, compared to its affect on sea transport and port operations. Because in rail and road transport, the technological developments had already been introduced; and the MTS as an integrated system simply connected these modes to other modes of transportation through its efficient operating system. Since road, rail and air transportation are more labor intensive industries, unemployment in these sectors affects the society more seriously compared to sea transportation. Therefore it can be stated that the use of the MTS in developing countries does not affect the pattern of employment considerably, as the only segment which can be affected is port and shipping industries, both of them generally referred to as capital intensive industries.

Therefore, it can be claimed that the MTS as a capital intensive industry, is not an appropriate area of investment for developing countries with regard to their scarcity of
capital, and abundance of labor. While the capital intensity of the MTS is not disputed here, some elements which are influencing factors in the employment patterns of the industry must be considered. First, there is great difference among the various modes of transportation since their employment effects vary considerably. At one extreme there is a fully automated container terminal, which is highly capital intensive, and at the other end, there is the highly labor-oriented trucking industry. Thus, the opposite effects of these extremes in one system known as MTS can offset each other.

Second, with regard to transport services provided under the umbrella of a multimodal transport system, employment effects vary considerably both quantitatively, and qualitatively. Therefore the actual level of capital required per job in the MTS cannot be generalized. However, it can be positively stated that investment in the MTS creates employment of relatively highly qualified persons in the operating companies as well as in numerous support and auxiliary services. Developing countries have been quite capable of providing the adequate manpower at all levels to develop and operate the industry efficiently.

Therefore, since the comparative advantage of cheap labor exists in most developing countries, it seems that, in many sectors of the industry there is no need for very large capital investments. However, the total analysis must be made case by case according to the existing situation in the country, and the demand criteria of the market. Thus it can be confidently stated, that substitution of the MTS for a traditional transport system should not affect the employment pattern considerably in most developing countries, where the existence of comparative advantage of cheap labor holds the opportunity for economic development. A significant potential exists for any employment losses brought about by capital investment in the MTS to be recouped, perhaps many times more, in the manufacturing industries that the MTS may facilitate. Also the MTS can initiate many supplementary and support services, which can create offsetting employment for the country.
iv.3. Investment on Support and Auxiliary Service Industries

The other economic significance of the MTS is its effect on other auxiliary industries, which support the transportation system. Because of an effective transportation system through the use of the MTS, adequate infrastructure and expansion of existing infrastructure and facilities, result in encouraging various firms to service and support these industrial developments.

These are mainly additional investments in the various segments of the transportation chain. Construction of a new road network and increasing volumes of traffic in the road network due to use of the MTS and containerized cargoes will result in additional investment. This creates employment opportunity for the service and support industries of these sections. These are namely:

1. Investment in new gas stations, and road marts.
2. Maintenance and repair facilities for trucks and trailers.
3. Container repair yards.
4. Weighing stations, and measurement system.
5. Restaurants and food stations.
6. Mechanical and spare supply services.
7. Container, and platform leasing services.
8. Crane companies, pick-up, and delivery services.

The list of such services also depends on a country’s requirements and specific geographic location. Therefore the MTS may create additional investment and employment in other industries. If these investments are made by foreign firms, a positive contribution to the balance of payments will be achieved.
There are similar investment and employment opportunities in rail, sea, and air transportation industries through the use of the MTS, such as inland clearance depots, piggy-back services, cargo sites, additional rail stations, supply services, food industries, and many other auxiliary services. Thus these effects which are made in addition to those of the traditional transport system, can compensate the unemployment effects of the main industry as well.

Therefore, multimodal transport systems will grow in importance as more manufactured goods and merchandising firms become involved in developing countries. Also its contribution to the total economic development is one of the main factors that governments in the developing world should realize. Many industries, through MTS, can face the competition against foreign-based manufacturers that now can produce and load goods at customer docks as cheaply as the goods that can be produced locally. This phenomenon is fostered by reduced trade barriers, relative currency fluctuation, and the competitiveness of multimodal transport operators. As trade barriers come down, the importance and value of the MTS to countries with developing economies increases.

Also, investment in the MTS can result directly in improved productivity and expanded employment in the long run. Further progress in the MTS can be made through deregulation, technological advancement, changing patterns of the world trade, and the spreading adoption of computerization and electronic communications. The history of MTS development shows that these changes often require a long period of time, with a fairly long period for commercial, financial, legal and social acceptance. Therefore the macro-economics consideration for such development is not the only influential factor.

However, for developing countries, such macro economics considerations are primary elements in determination of benefit or losses of using such systems, because of crucial elements, such as scarcity of financial resources, employment problems, debt crisis, among other critical economic issues.
A final point on this topic relates to the involvement of individual governments of developing countries in the regulation of the transportation industry. In developed countries, most firms are becoming increasingly competitive in international purchasing and marketing, which practically requires a very efficient transportation system. The answer to their needs is the MTS. Their governments facilitate the use of such systems to increase their level of competitiveness and allow optimal use of their economic resources. Therefore policy makers in developing countries must understand that this process requires different approaches and procedures than those for very limited local and domestic trade. It is a discipline that is different in many ways from related domestic activities. The supply of the MTS, rate making, and public policy concerns are somewhat different than their counterparts in domestic trade and traditional transportation systems.
NOTES AND REFERENCES:

1 This is an average figure, computed based on my measurement on various developing countries.

2 Although the numerical calculation of using the MTS on ton-mile or ton-kilometer of goods movements can be computed for the whole economy, this is not the intentions in this paper.


5 These data represent all developing countries, which if we want to separate them according to region, Asia and Latin America show an upward trend in their export for the total period.

6 IMF (1992), The World Economic Outlook. Washington DC

7 This graph is drawn based on statistics extracted from ISL shipping statistics, and Containerization International. All are computed by myself, based on average data of various ports in these regions.


9 These figures are based on quarterly updates from Lloyds Register of Shipping/LIMS, and from MDS Transmodal. (January 1993).


12 A survey on IMF’s World Economics outlook and UNCTAD’s Handbook of International Trade and Development Statistics shows the eligibility of such statement.

13 Data extracted from directory of trade statistics.

14 Data extracted from World Economic Outlook, International Trade Statistics.

15 These figures are based on various computations of labour costs in developed and developing countries. Also factors like union-labour and non-union labour have been considered.
CHAPTER IV

CONCLUSION AND SUMMARY

At present, the organization of foreign trade in many developing countries is carried out almost exclusively under traditional segmented transport arrangements, with participating unimodal carriers responsible only for performance of services relative to their own specific leg of journey. Because of lack of necessary coordination and cooperation among these unimodal carriers, the result is increasing total cost of transport, which in turn has negative effect on these economies at large.

In such a circumstance developing countries suffer from a lack of adequate control over the transport chain due to limited participation in the transport process and to the remoteness of developing countries’ operators and authorities from the decision making bodies of the international transport industry.

Establishing the multimodal transport systems in developing countries, therefore partially helps to overcome the deficiency of traditional transport system in these countries. The aim of the MTS is to facilitate the movement of goods by reducing the total cost of transport through increased efficiency under the single responsibility of MTOs. In contrary to traditional transport systems, an MTS will ensure seamless movement of goods by an integrated process from and to points as close as possible to the consignor and the consignee.
Consequently, the effective implementation of multimodal transport require not only investment in facilities but also, equally important, overall structure changes ranging from new trade and transport practices to a revision and, to the extent possible, regional harmonization of legal, documentary and customs procedures. Developing countries have to set framework not only for regulating multimodal transport but also for promoting the activities of Domestic MTOs. The latter, operating to and from developing countries, would be in a position to foster effectively the trade and transport interests of developing countries, especially of land-locked countries, with regard both to quality and price of total transport services.

In fact, any society will be benefited by utilizing an integrated transport system both in terms of economic development and social objectives. Ideally an MTS should provide any country with a more cost and time efficient transport system. It should also increase the level of productivity for the production firms in the country, as well as widening them internationally. The MTS furnishes the economy to give a better opportunity to the consumers in acquiring higher quality products at more affordable prices.

It is common sense in international arena that the success of any nation to achieve its economic goal is largely dependent upon its foreign trade. The MTS as a catalyst and medium of such process can assist developing countries to procure their economic objectives more rapidly. In addition The MTS can support fundamental economic and social activities of the country more efficiently.

The potential benefits of the multimodal transport system for any country, in general can be summarized as follows:

(a) It helps any economy to boost more rapidly.

(b) It is one of the important tools in economic growth for any nation.
(c) Its cost efficiency allows customers to purchase higher quality goods at more affordable prices.

(d) Its speed of transportation gives both producer and consumer better opportunity to utilize their value of goods.

(e) It increases the level of productivity in any economy.

(f) It affects the national accounting positively.

(g) It allows alternative consumers’ choices more effectively than traditional transport systems.

(h) It increases the level of competition among production firms, which consequently can benefit from the market situation and decrease in prices.

(i) It affects the pattern of employment in auxiliary industries and support services.

(j) The MTS can result in closer cooperation among various countries, particularly land-locked states with their neighboring countries.

(k) It facilitates international trade by providing better connection between trading partners.

(l) It encourages additional investment in manufacturing industries due to its efficiency in connecting various locations.

(m) Its effectiveness in transporting goods results in the increase of value output in any economy.
(n) It gives a better elasticity of supply and demand for goods in any economy.

(o) It allows developing countries to participate in international trade more effectively.

(p) Increase in the net benefit of foreign currency can be a direct result of using the MTS.

(q) It allows local production to find wider markets, including export markets.

These potential benefits, however, are very general statements which can be applied to most developing countries. The facts of economics, political, and social differences in any country can affect the level of productivity, and benefits of the MTS to any country.

Indeed, the Multimodal Transport System in developing countries requires coherent and comprehensive transport policies to ensure optimum use of existing and new infrastructures as well as appropriate investments. These call for coordination of investment policies between the national authorities that decide on infrastructure investments and transport users. Furthermore, government regulations, tariff and user charges, documentation requirements, and bureaucratic measures should not hamper the smooth operations of the MTS in any country.

Promotion of multimodal transport and optimum use of infrastructure require careful considerations of the industrial aspects. Each government in developing countries should decide to what extent the public sector may actively participate in transport operations and establish a clear-cut functional decision between the public sector and the private sector in multimodal transport operations.

At regional and international levels, an active transport policy to facilitate the use of infrastructure, and required services for fast and safe movement of cargo by the MTS should be pursued by all developing countries. Different international conventions aimed at facilitating such smooth movements of cargoes and border crossings have been
adopted. Developing countries are required to become contracting parties to these conventions if they need the optimum use of the MTS in their countries for efficient trade. At least they can apply some of these convention provisions in their local law in order to facilitate MTSs operations. However, implementation of such regulations need certain financial commitment. International assistance therefore may be considered to implement these provision in these countries.

Financing the new infrastructure and upgrading the existing facilities is one of the most difficult tasks in many developing countries. Regional cooperation, particularly between land-locked states and neighboring coastal states, thus might be considered as the best alternative to provide required capital for construction of infrastructure.

In its initial stage, the multimodal transport system requires relatively small modification in equipment. Containers on freight cars (COFC) and trailers on flat cars (TOFC) can be transported on conventional rail cars. But, the growth in volume of traffic, and increases in level of competitiveness are the factors which require MTOs to be more efficient and competitive on an international level. This is where the additional investment on infrastructure and equipment is needed.

A successful economic model to establish an MTS, which can be valid for most developing countries is applied in two different ways, i.e. to establish a local MTO and to institute required infrastructure for the country.
1. A PROPOSED MODEL FOR ESTABLISHING AN MTO IN DEVELOPING COUNTRIES

Any carrier, freight forwarder can change his area of activities to form a multimodal transport operating company. But, before doing this, there are certain requirements to be met. Also, a potential MTO needs to know many things about the economy of the operations and the state of the market. Thus establishing an MTO is not a simple task.

The most valuable asset for an MTO is highly qualified personnel and expertise who know about international transportation procedures, and have thorough knowledge of the market and various influential elements in transport economics. There is also another important factor, which is the strict control of the MTO over total operations. This possibly requires well-founded contacts at home and abroad. This can be achieved by establishing international network of agents, representative, and joint ventures with foreign companies to carry a certain part of the operation at the other end.

The next step for a potential MTO is to carry out a thorough market research. Such a survey is required to determine the capability of market, supply and demand factors, the volume and types of commodity movements, the annual trading tonnage, seasonal fluctuations, present level of transport costs, current methods of sale and most commonly terms of trade (INCOTERM), and different economics and social constraints. Thus, sufficient time and efforts should be devoted to such research as it will have a critical role on the economic calculations of viability and feasibility of all the operations. If these elements were found satisfactory, then a potential MTO can proceed to further stages.

Another economic aspect which should be considered before establishing an MTO is to identify the trade which looks most promising. National statistics may yield the necessary data for identifying the major commodities and routes. Also key shippers and consignees
who control the sizable tonnage suitable for MTS moving on the chosen route should be identified. The potential MTO can approach them in order to find out their potential interest in shipment of their goods by the MTS, and examine viability of their operations.

Once the key shippers and consignees have been contacted and the feasibility of their operations have been proved, the next step is to obtain the necessary commitment of support for the new venture from the outset. Any potential MTO, however, should realize that only the most competitive transport package will benefit their countries economic situation. Consequently, it is quite obvious that shippers and MTOs have a common goal: to promote the country’s exports by reliable transport at competitive costs.

This is in turn will enhance the attractiveness of the product to the foreign importer who may then, through bigger sales, increase his future purchases. Larger purchase will then mean better economies for the exporter and the MTO leading to even more competitive consigns. It is also obvious that the MTO will only be able to persuade a shipper to give support, if he can convince him of his seriousness and professionalism. There is definitely the most important aspect which a shipper is very interested in, i.e. the cost of transport. This is when an MTO can impress the shipper by taking advantage of a cost effective MTS and fully exploit the benefits of the MTS.

The next step is to establish a good network of offices, representatives and agents, which are crucial for the success of MT operations. It may be advantageous to enter into contracts with foreign companies and expand the international network of operations. A proper use of communication systems and computerized operations is also very important in successful operation of the MTO.

The MTO should therefore calculate the cost of transport. This is related to the volume of traffic and percentage of total tonnage in a chosen route which he can assuredly acquire. By using national and international statistics on transport costs, major conference rates, and inland transport tariffs, it is relatively easy task to calculate the
average tariffs of required commodities. Then, MTO’s tariff quotation is about 5 to 10% lower than the market rate, he can attract a good share of other smaller shippers’ traffic on the same route. Based on this tonnage the MTO should calculate how much more cargo is required to make the new service profitable. Therefore, additional cargo should be generated, if necessary, through active sales efforts supported by competitive tariffs.

After ensuring the support of certain based tonnage, the MTO can seek to sub-contract other operators for a portion of through transport. In choosing sub-contractors, there are two basic important criteria, i.e. they should have the same commitment to service as the MTO, and they should be cost and time efficient in order to carry out successful operations. Thus they need to be competitive with other transport operators in the same area of activities.

When all these factors have been examined, a potential MTO should seek to establish his organization. The best possible option exists for shipping companies, as they have already possessed the most capital intensive part of the industry, i.e. vessels. (the exception of course is air transport). The fact that a domestic company is stronger at home than abroad, requires an MTO to find an equitable partner at the other end of trade to ensure that a balanced flow of traffic can be developed. There are many possibilities to take advantage of such joint operations. A potential MTO can form joint venture with foreign companies, make an agreement in form of regional cooperation, and use the advantage of joint operations with other domestic carriers. However, the important factor is strict control over the flow of cargo, equal commitments and interests by all parties concerned, and the pattern of a joint company’s liquidity movement in and out of developing countries.

Therefore, any firm can form an MTO depending on the extent to which the total operations are desired to expand. However, certain financial capabilities, and physical capacities are essential in formation of a local MTO in developing countries.
2. A Proposed Model for Investment on required National Infrastructure

In addition to those elements which are necessary for the formation of an MTO in developing countries, there is a need for adequate investment and strategic policy for developing countries in the transport industry. This obviously is dependent upon mainly on the economic and social condition of any country. In this paper, therefore, a general model which in most cases is valid can only be stated.

Multimodal transport requires an integrated approach to ensure optimum use of capital for transport investments and an adequate policy environment to obtain best operating results. Therefore there should be a distinction between those engaged in the provision and use of infrastructure and equipment, i.e. operators, local and national authorities, and regional organizations, and those involved in the elaboration of coherent policies at each decision-making level.

Transport policies should be designed to ensure optimum use of existing infrastructure and equipment and optimum decisions regarding new investments. Policy-makers in developing countries should consider certain crucial elements, such as the relationship of costs to user charges; the level and structure of tariffs; the regulatory system; and the institutional framework.

Another fact in developing countries is that investments on new infrastructures require scarce foreign currency. This aspect should be considered carefully, all cost/benefit analysis should be carried out in order to avoid any waste of capital and consequently affect the national economy adversely. Developing countries should therefore endeavor to rationalize capital investments, taking into account the needs of all links in the transport chain, so that a balance development can be achieved. Investment decision should be based on a systematic application of cost-benefit analysis. This applies not only
to decisions for new investment but also to decisions on upgrading existing infrastructure to meet the minimum requirements of multimodal transport. Also the extent of such investments are dependent upon the type of transport technology adopted for MT operations and the scale of its application.

A coherent transport policy also needs an adequate institutional framework. Responsibilities of various government ministries and agencies regarding policy-making and coordination levels should be clearly defined. A leading agency should take the responsibility of investment policies, as well as transport policies at a national level. A planning board consisting of various agencies concerned with the MTS should therefore analyze such policies, and propose an integrated policy to ensure coordinated planning for transportation at the national level. At the regional level, the national bodies could serve as agencies ensuring implementation of common policies agreed among the governments concerned.

In many developing countries very often the capital needed for investment is not readily available. The question where to obtain such funding should therefore to be tackled. The main problem is normally the foreign exchange component of the investment which can be obtained from number of international agencies or through regional coordination programs. However, this is different from country to country, and obviously can not be discussed in this paper in details. The capital required for investments is always available within the international funding organizations or international banking or investment community. Any developing country who needs to obtain such finance can always acquire it, but the main question is to what price. This certainly depends upon the authorities in that government and the prevailing situation of the country’s trade in within the international framework.

The final point related to this topic is that the cooperation and coordination of public organizations, private companies can help in rapid development of the MTS in any country. In fact the coordination of government agencies, and initiation of private
organizations in developing countries can mark the potential benefits of the MTS for any country's economy.

Indeed, establishment, development and efficient operations of the MTS is a very difficult task to perform in developing countries, since there is lack of capital, inadequate technology, and information exist in these countries. But, if developing countries wish to participate in international trade more effectively, and take the potential advantages of the MTS to the benefit of their respective countries, they should, and can establish the MTS in the most effective and useful manner.
BIBLIOGRAPHY

An Institute of Civil Engineers Conference (1987) European Transport, London: Institute of Civil Engineers.
Japan Maritime Research Institute (1986) Medium to Long Term Analysis of the Shipping Market, Kobe: Japan Maritime Institute
Lloyd’s Shipping Economist (1994) Shifts in the Liner Trades from Competition to Cooperation, London: Lloyd’s Shipping Economist 15, pp.18-19
Murr, A (1979) *Export/Import Traffic Management and Forwarding*, Maryland:
Cornwell Maritime Press.
Paris: OECD
University press.
London: Kogan Page.
Ractcliffe, B (1987) *Economy and Efficiency in Transportation and Distribution*,
London: Cogan Page.
Sturmy, S G (1979) *Shipping Economics*, UK: Redwood Burn Ltd.
Thomas, B J (1994) *The Need for Organizational Change in Seaports*, Marine Policy
18. pp.69-78.
Tobak, D H (1970) *Cargo Containers Their stowage handling and Movement*,
Cambridge: Cornell Maritime Press Ltd.
The Logistics and Transportation Review *Vol.20 Number 4* (1984), California:
Berkeley.
UNCTAD (1991) *The Economics and Commercial Implications of the Entry into Force*
*of the Hamburg Rules and the Multimodal Transport Convention*, New York:
United Nations Publications.
UNCTAD.