INTERMODAL TRANSPORTATION:

NEED, STRATEGIES AND

COMPETITIVE RAMIFICATIONS

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1. INTRODUCTION

Intermodal transportation provides through movement of cargo from origin to ultimate destination using at least two different modes of transport while moving under a single rate on through billing, and through liability. While one writer considered it to be the science that deals with the movement of goods using various modes of transport[(1)], another found it to be a logical, cost effective and time saving transportation system which can be the integral factor in facilitating the free flow of a nation's international commerce.[(2)] Whether one considers intermodalism to be a science or an art,[(3)] what is irrefutable is its basic motto of efficient and continuous cargo movement through careful planning and coordination.

Unlike containerization, intermodalism is not a technological revolution. If containerization is microeconomic, intermodalism represents macroeconomic innovations in transportation. All the elements involved in intermodal movements are as old as transportation itself. What was lacking was the coordination and the synchronization between the various elements involved. The arrival of the box and **containerization**, certainly facilitated the integration and the coordination of responsibilities. Thus, the added dimensions to the time-honoured ways and means of cargo movement have brought about the realization of door-to-door movements on a global scale.

2. THE PERCEIVED NEED FOR INTERMODALISM IN THE CONTEMPORARY NEOLOGISTICS ERA

Importers and exporters of today operate in a highly competitive, and globalized market. In order to gain competitive advantage in such a marketplace, traders have altered their business policies and competitive strategies. One area which has received very significant attention on the part of these global traders is that of business logistics which has become an important component of the landed price of the good.[(4)] According to one study, worldwide logistics costs amounted to $1.2 trillion in 1991 and is projected to exceed $2 trillion by the turn of the century.[(5)] The other reason for the increasing attention being paid to logistics is the current focus on quality in general and quality customer service in particular. The logistics superiority of a firm can facilitate differentiating its level of customer service from that of its competitors in the marketplace.[(6)]

The neologistics era broadens the systems perspective beyond logistical activities and interests. Logistics has evolved into a critical subsystem of the overall enterprise, whose goal is the maximization of profits for the whole enterprise. Rather than mechanistic routing of cargo, today's sophisticated and well-educated logistics managers are **management generalists** and are expected to think and look beyond their immediate responsibilities while playing an integral part in the development of corporate strategy and decision making. Due to the realization that it is best for businesses to focus on their primary responsibilities (such as finding resources, production, and marketing), the relationship with their perennial nemesis, the operators, is no longer confrontational. On the contrary, there is increased emphasis on cooperation and partnership with a limited number of transportation entities. To accomplish this, contemporary logisticians need to possess the skill to negotiate **win-win** contractual agreements. While there has been some amount of corporate downsizing of logistics departments as part of the overall approach towards cost efficiency and better productivity, this does not in any way diminish the increasingly important role of these departments.[(7)]

The present trend towards global sourcing and worldwide channels of distribution and, indeed, the expanded scope of logistical activities have facilitated the implementation of sophisticated management techniques to control the total costs in business logistics.[(8)] Major contributions by management science in the areas of (inbound) materials movement include **MRP** (Materials Requirements Planning),[(9)]**JIT** (Just-In-Time)[(10)] and **QR** (Quick Response).[(11)] All these techniques streamline delivery pipelines and reduce inventory levels to a minimum to save costs while increasing their ability to respond to the marketplace demands. Though their evolution owed much to the relatively high interest rates of the 1970s and the early 1980s,[(12)] they have now become an integral part of the competitive strategy of contemporary shippers.

While most of the attention of contemporary traders has been on controlling the inbound logistics costs, the neologistics era also emphasizes the importance of customer service and outbound distribution. There have been attempts to introduce the principles of inbound logistics to that of outbound distribution--called **DRP** (Distribution Resource Planning)--despite the practical difficulties of implementing them on such a rigorous basis as that of a tightly scheduled manufacturing cycle.

The concept of door-to-door intermodal transportation is an ideal mechanism to accomplish the cherished efficiency goals of inbound and outbound logistics. Importers and exporters, operating in the contemporary neologistics era recognized that door-to-door, enterprise-wide transportation systems would add to their competitive advantage in the global marketplace through facilitating the reduction of inventory costs. Substituting an intercontinental movement by rail for a circuitous all-water movement by ship saves considerable in-transit inventory costs besides the savings in time. The shorter lead time which reduces the total cycle time--time during which the goods are kept in the shippers' system--also reduces the interest burden of shippers.[(13)] The easiness of negotiating and dealing with one specialized transportation entity for all the complexities of a global cargo movement frees the traffic manager of the considerable time and effort needed to coordinate such a movement through a multitude of carriers. Thus the requirements of contemporary shippers gave an impetus for coordinated international intermodal movements.

3. INTERMODAL STRATEGIES OF LINER OPERATORS[(14)]

Historically, it has been argued that it was the advent of liner shipping in the early nineteenth century which eliminated the need for integrating merchanting and deep-sea shipping.[(15)] In 1984, Casson studied 28 shipping companies operating in, or controlled from the UK. The study found that a significant number of the shipping companies studied were involved in agency services, freight forwarding, stevedoring, warehousing, providing port facilities, road haulage and distribution. He credited the above developments to the operational flexibility introduced through containerization, and emphasized that containerization strengthened the incentive to integrate shipping with other modes of transportation and port facilities. The advent of containers on international trade routes certainly contributed to the natural leadership role of deep-sea liners. The use of large container vessels gave them the necessary economies of size in their deep-sea shipping movements without unduly prolonging time in port. It also necessitated the coordination of ship arrival times with train schedules and their expeditious inland movement. The traditional nature of liner conferences, that of encouraging service competition rather than price competition, made it imperative that intermodalism be a competitive essential rather than a mere option. The modus operandi for such extension of services was initially through cooperation with domestic operators. As cargo volumes reached a critical level, deep-sea liner operators virtually began to take over the operations of their intermodal associates with the twin goals of expanding their area of control and reducing their costs.

Today the point has been reached where keeping out of some form of control over the inland distribution system of liners is strategically unwise. Thus, the likelihood of rival production firms integrating vertically into shipping activities for competitive purposes[(16)] can be modified to apply to contemporary deep-sea liner operators. When one liner operator establishes itself as a multimodal entity, competing firms are compelled to undertake similar operations. In addition to the acquisition of inland transportation companies, other vertical integration opportunities for liner shipping companies include acquiring warehouse and distribution centres, freight forwarders, custom-house brokers,

and EDI firms. The transition of deep-sea liner operators into total transportation entities is considered to be one of the most exciting developments of the intermodal revolution.[(17)] Deep-sea liner operators tend to follow three distinct strategies in providing intermodal services.

3.1 Direct Ownership of Inland Carriers

This strategy involves the acquisition of intermodal partners and their equipment, and (probably) a resulting hierarchial organizational structure. While it gives complete control of the cargo movement and might add synergy to the integrated cargo flow, it requires high capital commitments. At the same time, the financial risks involved in such ventures are also high.[(18)]
An example of this strategy is the British P&O Group's acquisition of the German Rhenania Group. Rhenania Schiffahrts und Speditious GmbH was a West German transport and distribution company that used to operate 450 trucks and trailers. In addition, they also provided extensive services on the Rhine river using their fleet of 33 barges.[(19)]

3.2 Strategic Alliance

This strategy enables the liner operator to offer the same level of services as any other intermodal entity but without the high level of financial investment and risk associated typically with vertical integration; this makes it appealing to all intermodal operators, big and small. For the smaller liner operators, this may indeed be the only available intermodal option.

Another virtue of strategic alliance is the probability of synergism occurring in such relationships. Capitalising on the well established network and goodwill of a local land-based transportation entity provides immediate name recognition and identity for a foreign liner operator. There are several examples of strategic alliances in the intermodal industry. The involvement of CSX/Sea-Land in sprucing up the trans-Siberian landbridge operations is one such example as is the involvement of the P&O Group with Mayne Nickless and Qantas in Australia which has created the Australian Global Logistics Services providing global intermodal transport and distribution services for Australian importers and exporters.[(20)] Another important example of this strategy is that of Hapag-Lloyd, the large German deep-sea liner operator. Following a rather conservative operating strategy, this container operator has stayed away from outright acquisitions of land-side operations and emphasizes partnerships with efficient third parties who can offer guaranteed levels of services to facilitate door-to-door movements.[(21)]

3.3 Mixture of Ownership and Partnership

Most intermodal operators follow this strategy at least in a limited sense. Several intermediate positions are however possible under this broad category. Typically, in the US, direct intermodal investments by deep-sea liner operators are confined to cross-country lanes and/or dense corridors (such as from Southern California, or from the

Pacific North West to Chicago). Along these routes, operators make heavy investments, through direct ownership or long term lease of assets, in order to provide a tight-knit door-to-door service. On the less dense lanes, the tendency is to make more use of common carrier services and thus limit the risks associated with ownership.

4. THE COMPETITIVE RAMIFICATIONS OF INTERMODALITY

The availability of door-to-door services has had a significant impact on the competitiveness of virtually everyone associated with it. While the impact on some has undoubtedly been positive, that on others is at best indeterminate. In this section, the competitive ramifications of intermodality on shippers, ports, liner operators and conferences will be discussed.

4.1 The Impact of Intermodality on Shippers

Multinational sourcing and globalization of production, as discussed earlier, have naturally expanded the sphere of operations of most shippers. The establishment of regional markets such as the ASEAN in the Far East, the Canada-US Free Trade Agreement, and the economic unification of EC nations are creating new opportunities for enhancing international business while diminishing bureaucracy. Such pan-continental regionalization of the economy offers better opportunities to the business community to implement effective distribution strategies, and to enjoy economies of size.

The evolution of intermodalism could not have been more opportune for shippers. The through movement of cargo from door-to-door on a single bill of lading, with one transportation entity providing everything from consolidation services and liability coverage to inland distribution, offered a new and efficient option to the international trading community seeking competitive advantage. When a transportation company offers the entire range of logistics support in addition to the basic door-to-door movement of cargo, for many of the shippers it reduces most operational impediments to international trade. Thus, in response to the needs of customers, the intermodal operators have become reliable transportation partners and strive to provide a continuous pipeline for the movement of goods without delay, damage, and inventory stockpile or shortfall. The availability of modern information technology has brought within their reach the possibility of paperless documentation and the ability to make instantaneous decisions in the global marketplace. Shippers have thus benefitted from intermodality, whether of the basic door-to-door type, or of the highly sophisticated just-in-time type.

It has been stated that in the intermodal era, shippers have lost their traditional role in choosing the route and the domestic mode of transport which would carry their cargo.[(22)] While this is indeed true, the real issue is whether or not this operational change has any significance. The intermodal operators can offer an efficient and synergistic transportation system which precludes the need for the conventional type of (shippers') supervision of their transportation arrangements. Intermodal transportation may also cost more than a combination of mode-specific cargo movements. However, computation of the total logistics cost often justifies the use of the intermodal option.

From an organizational standpoint, while the big shippers can possibly put together cost-effective (transportation and) logistics packages, it is beyond the reach of most small shippers. The possibility of receiving such services from a transportation company, custom-made to suit the needs and desires of individual shippers, big or small, certainly has attractions ranging from simple economics to pure convenience. Though in the extreme case this has resulted in the complete elimination of in-house transportation and logistics departments, in most cases this has resulted in fine-tuning the subsystem towards better productivity and efficiency. Traffic managers, in today's deregulated marketplace, concentrate on the overview rather than the tunnel. Having been relieved of their traditional, mundane responsibilities, these executives now have more time to do what they really should be doing, and thus contribute towards the overall profitability and return on investment of the entire organization.

4.2 The Impact of Intermodality on Ports

Seaports, an unavoidable subsystem within the transportation system, are crucial in international as well as domestic shipping because they facilitate the transfer of cargo between the sea-mode and the inland-mode of cargo movements. Being a component of the transportation system, ports have always had to make changes in their modus operandi to accommodate the bigger changes within the parent system. Thus, traditionally, ports play a reactive role in which continued competitive advantage over rivals necessitate faster adaptation of new technology which in turn requires higher and higher capital commitments. Indeed this was what containerization thrust upon ports.

Containerization provided the possibility of consolidating cargo at a handful of ports along arterial trade routes. This was essential for the liner operators to achieve economies of size. Calling only at those ports which offer large volumes and the best technology facilitated the rapid turnaround of their expensive container vessels. The possibility of restricting **mother vessel** ports of call to only the major **load centre** ports became a principal threat for other ports who would have been relegated to an inferior status and served only by a network of feeder vessels. In the race for survival which ensued, large investments were made by all ports to cope with the demand for rapid cargo movements. While the load centre nightmare of ports did not materialize--at least to the magnitude that was expected--what really resulted was the intensification of competition between ports in the same region (all of whom had invested in competing technology and infrastructure to attract the deep-sea liner operators). Thus, intra-regional port competition intensified subsequent to the introduction of containerization. Ironically, as a direct consequence, ports began to pursue aggressive expansion programmes designed to enhance their capabilities, even when there was a decline in their overall market share. Examples of this are the North Atlantic ports between New York and Charleston, all of which are still involved in increasing their terminal capacity. Furthermore, these ports in the US North Atlantic region are also in fierce competition with the Canadian ports of Saint John, Halifax, and Montreal.

Similar large scale terminal enhancement programmes are also going on across the Atlantic in Europe. Some major upgrading projects currently underway are at Le Havre

($2.5 billion), Zeebrugge (a new container terminal of 500,000 TEUs per annum), Antwerp (development of the Hessenatie Scheld Container facility), Rotterdam (a new 500,000 TEU container facility at its Rhine North Sea outlet), and the German ports of Hamburg, Bremen and Bremerhaven (to recapture their traditional hinterland markets in Eastern Europe).[(23)] In the UK, Thamesport on the Isle of Grain has emerged as the newest container port. It is 45 miles closer to London than Felixstowe. Furthermore, it is located strategically close to the entrance of the Anglo-French channel tunnel on the Kent coast, which may enable Thamesport to become an intermodal hub for containers to and from Europe.

Unfortunately for the ports, before they could complete their huge infrastructure investments to facilitate containerization, further exogenous changes were thrust upon them.[(24)] The facilitation of door-to-door intermodal cargo movement requires the elimination of all bottlenecks, and a smooth and uninterrupted cargo flow through the port subsystem. Ports with excellent road and rail connections thus became the natural choice for intermodal hubs.

Using a through bill of lading for the door-to-door movement leaves the choice of port to the intermodal operator. Thus, the traditional ties between the shippers of a region and their home-port could, and has become less sacrosanct in the process of designing optimal intermodal systems. The nature of the relationship between the intermodal liner operators and their customers is more direct. The operators choose ports ideally situated to implement their intermodal strategy. A direct consequence of this has been the demise of the traditional hinterland and foreland relationships of a port with its customers.

Thus, while containerization intensified the competition between ports within a region, intermodalism has taken the level of competition to an even higher level. The introduction of inter-regional competition in addition to the intra-regional competition has caused dramatic shifts in the traditional cargo flow. A good example of this is the rapid decline of all-water cargo movements to and from the East Coast of North America, and the Far East and Japan. Such cargoes are increasingly being handled by the ports on the West Coast of North America, with minibridge or microbridge services providing the inland move.

These radical changes necessitate proactive strategic planning and aggressive marketing in addition to traditional waterfront innovations by ports. As part of that, ports have diversified into non-traditional areas and responsibilities. Indeed this is necessary because of the marked shift in emphasis in the marketplace--from the shipper to the intermodal operator. Every conceivable scheme is being implemented by ports to lure liner operators and thus maintain market share and profitability in their operations. Examples of value added options incorporated on the dockside include fast container-handling cranes, warehousing and distribution services, and quick cargo clearance through improved documentation process and computerization. Implementation of information systems, and terminal automation to facilitate equipment identification have further enhanced the competitive status of major ports. All major container ports are investing huge sums of

money in this area to carve their own niche. A list of initiatives undertaken by ports in the US to implement this strategy is shown in Table 1.

Table 1. Port EDP/EDI Initiatives in the US

PORT EDP/EDI SYSTEM

Baltimore **ACROSS** (Automated Cargo Release and Operations Service System)

Miami **MICS** (Miami International Cargo Systems)

New Orleans **CRESCENT** (Computerized Reporting and Expediting of Shipments to Control Essential New Orleans Trade)

New York **ACES** (Automated Cargo Expediting System)

San Francisco **RACERS** (Regional Automated Cargo Expediting and Release System)

Savannah **COBRA** (Customs On-Line with Brokers for Rapid Action)

Seattle **SCAMPI** (Seattle Cargo Automated Marine Procedure Interface)

Tacoma **MTAMS** (Marine Terminals Automated Management System)

Sources: Various

In the US ports, drayage (the movement of containers from the dock to the rail terminal) has always been the Achilles' heel. To remove this bottle-neck, on-dock rail terminals are being rapidly built by port and terminal operators. This concept is based on the premise that such direct transfer of containers will give better control to the intermodal operator as well as eliminate the cost, and reduce the time associated with drayage. Port officials at major ports like Los Angeles and Long Beach plan to have near-dock rail service facilities for every container terminal there by the year 2020.[(25)]

Further, double stack trains have become the accepted norm for the inland movement of containers to all major interior points in the US. While these movements are generally coordinated by transportation companies, there was even a move by the ports of Los Angeles and Long Beach to run their own common carrier train services to serve the smaller liner operators.[(26)]

The port of Seattle in the Pacific North West is an excellent example of an aggressive modern port which thrives on dynamic intermodal initiatives. Its transportation services division offers a unique menu of programmes operated directly by the port including freight consolidation services, shippers' agent services, truck contract programme, warehousing, and a sea-air transloading service for Europe-bound Asian cargoes.[(27)]

With the virtual exhaustion of value added options on the dock-side, ports in the US are moving inland to gain further competitive advantage. A good example of this is the Virginia Port Authority which has opened an inland intermodal complex two hundred and twenty miles away from the port. The port authority claims that using this facility for container shipments through their port of Norfolk will cost US$250 less than the cost of direct moves through their main competitor, the port of Baltimore. Similar initiatives are being considered by other ports, particularly on the West Coast of the US, to augment their competitive status.

4.3 The Impact of Intermodalism on Liner Markets

The unitization of liner cargo by using ISO containers opened up a Pandora's Box of opportunities for liner operators. With the elimination of the legal impediments to intermodalism, human ingenuity began to overcome the traditional boundaries of liner service which until then did not extend beyond the immediate vicinity of ports. Thus, with the arrival of intermodalism a new cycle of innovation began in liner shipping.

Though intermodal services were initiated as a marketing concept to attract customers, it has changed from being a marketing ploy to that of an accepted component of the liner transportation package. Most of the major liner operators have expanded their services into all aspects of global distribution and logistics support packages through horizontal and vertical mergers and acquisitions. Furthermore, most major operators have entered into partnership agreements with each other. Thus, there has been a concentration of power--through ownership as well as through partnership--among those operators who have differentiated themselves into the upper echelons of contemporary liner services. There has also evolved a second tier of operators who rely primarily for providing intermodal services on strategic alliances with operators of inland modes of transportation. All the other operators who continue to provide conventional port-to-port liner services now constitute the third and the bottom tier.

The impact of intermodalism in introducing inter-regional port competition was discussed earlier. From the standpoint of liner operators, the corresponding change due to intermodalism was the introduction of inter-conference competition. Such competition, along with the intra-conference pricing competition mandated by the 1984 Shipping Act in the US liner markets,[(28)] appears to have transformed the competitive status quo (desired typically by the liner conferences) into a more dynamic environment.

The evolution of a new breed of well-financed independent operators has been one of the most significant developments of the container era. The use of a few high capacity, fast container vessels, manned by cheap crews from third world countries and calling at a

limited number of ports enabled these operators to provide quality liner services comparable with those of conferences at lower freight rates. During the intermodal era, some of these operators have consolidated their position vis-a-vis the conferences. Either through direct ownership or through strategic alliances, they too provide seamless intermodal services though the sophistication of their intermodal capability may not match that of the more established conference operators. Thus, in the intermodal era, the axiomatic service-competition advantage of liner conferences over independents has in some cases lost its relevance.

While containerization and intermodalism have caused significant structural changes in liner shipping, what has not changed is the profitability of liner operators. The more aggressive liner operators invested in state-of-the-art intermodal systems during the 1980s with the expectation of better returns on their investments. However, as their intermodal systems have matured, rather than demonstrating increased profitability, these aggressive liner operators have been posting weaker financial performances.

American President Companies (APC), the biggest double stack container operator in the US, suffered significant reduction in its return on investment--from 8 per cent (from 1984 to 1988) to 3 per cent in 1989.[(29)] From 1980 to 1989, while APC's assets increased by 183 per cent and their revenue increased by 287 per cent, their operating profit reduced by 49 per cent and the net profit declined by 74 per cent.[(30)] The poor financial performance of APC has continued into the 1990s. This state of affairs is not unique to APC. SeaLand underwent radical restructuring during 1989-90. All major European operators have also reported weak financial results and are taking remedial measures. The Nedlloyd Group in particular has undergone serious restructuring and manpower changes during 1990/91. P&OCL is also undergoing organizational changes to trim their expenses.

There are many reasons for the continued relatively poor profitability of liner operators. One such reason is the endemic overtonnaging in the industry. This overtonnaging, which has affected the industry throughout the 1980s, intensified towards the end of the decade with the cellular container fleet growing by 6 per cent per annum. The sluggish economic growth of developed countries has also exacerbated the excess capacity situation.

Another reason is the alleged cross-subsidization of the inland moves by the deep-sea leg.[(31)] It has been stated that in a complete door-to-door intermodal transport package, the cost of the sea-leg is only 30 per cent while the seafreight contributes 80 per cent of the total revenue.[(32)] A 1992 survey conducted by the author also revealed that intermodal services provided by liner companies are subsidized by freight earned on the ocean. Thus, the bulk of the sea-freight earnings of an intermodal liner operator go towards meeting the operational and the overhead expenses on the land-side of an integrated intermodal movement. Furthermore, most liner operators have shifted their emphasis towards controlling costs rather than attempting to increase their revenue in an overtonnaged market (for fear of losing their market share). So, exogenous conditions have intensified the inherent inability of the deep-sea mode to continue subsidizing the inland movements.

Further, ex post facto analyses indicate that some liner operators, in their anxiety to create the best vertically integrated transportation network, or in simply trying to match the aggressive moves of competitors, made some acquisitions which were not integrated even after a prolonged period of gestation. The significant restructuring which companies like APC, SeaLand, Nedlloyd and P&OCL have undergone recently serve as ample testimony to the lack of integration of their intermodal services during the 1980s. Also the **swarm of imitators** offering landbridge, minibridge and microbridge services using common carrier liner trains has expanded substantially, as a result of which the competitive advantage of the pioneer intermodal operators has all but vanished.

Given the above developments, the recent concerns regarding the very need for intermodal services as well as questions concerning the viability of such services are hardly surprising. It has been argued that value added intermodal services provided by some liner operators is too sophisticated for the average shipper and that an attempt is being made to impose such services on the shippers.[(33)] Fundamental concerns regarding the viability of liner-oriented intermodal services stem from two areas, viz., economic and organizational, both of which emphasize the inherent incompatibility between the deep-sea mode and the land-based modes of transport. The concern from the standpoint of economics is that intermodalism aims at integrating shipping which has high fixed costs and low variable costs with the land-based modes of transport which have low fixed costs and high variable costs.[(34)] The organizational concern is that a shipping company has a hierarchial management structure whereas running an intermodal service requires a horizontal management structure, culminating in imperfect organizational structures for liner operators providing intermodal services.[(35)]

5. CONCLUSION

The paper discussed the perceived need for intermodalism, and the intermodal strategies of liner operators followed by the competitive ramifications of intermodalism on shippers, ports and liner operators. It was observed that shippers have benefitted from intermodalism. In the case of seaports, it has led to a definite increase in intra-regional and inter-regional port competition. However, the examination of the competitive ramifications of intermodalism on liner markets showed rather complex and conflicting outcomes. Large operators such as APC and P&OCL are becoming even larger though their profitability and other pertinent financial data do not reflect this. While some established operators (e.g. US Lines) have disappeared completely, relatively new liner shipping companies such as Senator Linie and Cho Yang, who concentrate on basic port-to-port services, seem to be growing. Paradoxical as it might sound, the very issue of liner-oriented intermodal services has become debatable in the intermodal era.

NOTES AND REFERENCES

1. Muller, Gerhardt (1989), Intermodal Freight Transportation, 2nd Ed. (Westport: ENO Foundation), p.1.

2. Kanuk, Leslie (1987), "International Transportation Systems and World Trade," Third Annual Business Conference, Ports Canada. Quebec City, Canada, 14 May 1987.

3. Graham defined intermodalism as the "concept of transport between more than one mode, its essential feature being the ability of the provider to offer shippers a complete door- to-door service". See Graham, Michael (1989), Effective Intermodalism, Hong Kong: Lloyd's of London Press, p.13.

According to Hayuth, it is "the movement of cargo from shipper to consignee by at least two different modes of transport under a single rate, through billing, and through liability, with the objective of transferring goods in a continuous flow in the most cost- and time-effective manner." See Hayuth, Yahuda (1987), Intermodality: Concept and Practices, London: Lloyd's of London, p.15.

Buckley (1988) viewed it as a systems approach to transportation whereby cargo is moved in a continuous through movement, between origin and destination, using two or more modes of transportation in the most efficient manner.

4. The dramatic changes taking place in the world of business logistics has not received full attention of some writers. Hayuth, for example, considers logistics as a transport system option along with four others all of which could really be considered subsets of a contemporary logistics system. See Hayuth's (1987, 7) discussion of decision variables and transport system options.

For a discussion of logistics as a critical success factor in both goods and service industries, see the following recent studies:
A.T. Kearney, Inc. (1991), Improving Quality and Productivity in the Logistics Process.
Arthur D. Little, Inc./Pennsylvania State University (1991), Logistics in Service Industries.

5. Source: A Study conducted by Temple, Barker and Sloane, cited here from Schulz, John D (1991), "Outsourcing Expected to Cut Number of International Container Carriers." Traffic World 2 Dec 1991, p. 37.

6. This is emphasized in both the 1991 studies cited in note 4.

For a discussion of the findings of the two studies, see Felice, Marc (1991), "Service Logistics Focus on Customer Requirements." WorldWide Shipping Oct./Nov. 1991, p. 16-21.

7. Another development of this era is the evolution of third parties who provide contract logistics services in response to the needs of those consumers who are sceptical about the magnitude of commitments that must be made in order to maintain an appropriate in-house logistics division. Third party logistics firms combine their resources with the assets of their customers and that of other entities to offer custom- made integrated logistics service to add to their client's competitive advantage. For a good discussion on

contract logistics, see Anderson, D.L. and Gillies, J. (1991), "What Can We Learn From Western Europe?" American Shipper, January 1991, p. 45-53.

8. For a discussion of the six components of total business logistics costs, see Tyworth, J.E., Cavinato, J.L. and Langley, Jr., C.J. (1989), Traffic Management: Planning, Operations and Control, Reading: Addison-Wesley.

9. **MRP II** (manufacturing resource planning) has virtually replaced the original MRP (MRP I) concept. MRP II originated from the general dissatisfaction with MRP I. It adds the functions of marketing, finance and purchasing to the more traditional materials requirements planning of MRP I. For details, see Hutchinson, N.E. (1987), An Integrated Approach to Logistics Management, Englewood Cliffs, New Jersey: Prentice Hall, p. 114.

10. While JIT aims at increased production efficiency through elimination of inventory, **JIT II**, a concept of the 1990s, goes a step further in increasing efficiency through the elimination of salesmen and buyers from the inbound purchasing process. For a good discussion of JIT II, see Warren, B. (1991), "JIT II." American Shipper, December 1991, p. 42-47.

11. Quick Response is the equivalent of JIT in the retail industry.

12. Johnson, J.J. and Wood, D.F. (1990), Contemporary Logistics, 4th Ed., New York: MacMillan, p. 44.

13. A cut in lead time by one day could save the Sony Corp. an estimated Y200 million per year! For details, see Eve,
Christopher (1991), "Shipper's Requirements: Speed is the Key to Sony's Heart." Seatrade Business Review: Container Report May/Jun. 1991, p. 111-113.

14. The intermodal strategies discussed here are used by liner operators virtually everywhere.

15. Casson, M.C., Barry, D., and Horner, D. (1986), "The Shipping Industry." Multinationals and World Trade, London: George, Allen and Unwin, p.343-371.

16. Kindleberger, C.F. (1984), Multinational Ship Ownership, Mimeo.

17. McKenzie, D.R., North, M.C. and Smith, D.S. Intermodal Transportation - The Whole Story, Omaha: Simmons-Boardman.

18. For example, the poor financial performances of the American President Companies and the Nedlloyd Lines, two premier intermodal operators, have been traced to this intermodal strategy of direct ownership.

19. Source: Porter, J. (1989), "EC Maritime Industry Warily Approaches 1992." Journal of Commerce and Commercial 13 June 1989, p. 17C.

20. Canna, E. (1990), "P&O Containers: A Long-Term Survivor." American Shipper June 1990, p. 18-20.

21. Boyes, Jane R.C. (1990), "Hapag-Lloyd Sets An Agenda for the Nineties," Containerisation International June 1990, p. 31-37.

22. Hayuth, Y. (1987), op.cit., p. 11-12.

23. Stoner, Leigh (1990), "New Terminal Capacity is Causing Shifts in Distribution Patterns of US Goods." Traffic World 22 October 1990, p. 21-26.

24. Hayuth, Y (1987), op. cit., p. 65.

25. Chancellor, Andrea (1989), "On-Dock Cargo Loading: The Wave of the Future." American Sailings 17 April 1989, p. 12.

26. The move to offer the proposed Southern California

Overland Rail Express (SCORE) from San Pedro Bay to St. Louis and New Orleans/Memphis was eventually canceled because of pressure from other port tenants. For details, see Knee, R. (1988), "Should Ports Run Their Own Stack Trains?" American Shipper, August 1988, p. 54-56.

27. Bowman, R.J. (1989), "New Port Profit Strategy." AmericanSailings, 23 October 1989, p. 10-11.

28. For a detailed examination of the impact of the 1984 Act, see the following publications:

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---, (1988), "U.S. Maritime Regulation: History and Evolution of the 1984 Act." Maritime Policy and Management **15** (3),
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