COMPETITION BETWEEN EUROPEAN PORTS AND THE EFFECT ON INTERMODAL DEVELOPMENT

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INTRODUCTION

The past 3 to 4 decades have been characterized by far-reaching structural changes in general cargo shipping, including technological and organizational changes. In an attempt to reduce the costs of maritime transport—mainly by reducing cargo handling costs and ships' time in port and thereby realizing economies of scale—unitization, especially containerization, was introduced in international shipping in the late 1960s. After initially being confined to trade among developed countries, which is characterized by relatively large cargo volumes and balanced trade flows, these new methods of shipment were introduced to trade with developing countries.

The main reason for the introduction of container transport was the increasing cost of labor in developed countries. The need to increase labor productivity called for capital-intensive transport systems in which quantitative labor inputs were minimized. These technological changes not only brought about a process of capital/labor substitution but also increased the efficiency and speed of transport, mainly by speeding up handling operations in ports through greatly reduced packing requirements and handling processes at all transfer points.

Initially containers were transported on a so-called sea-route or dock-to-dock operation, in which containerization takes place mainly for the ship's convenience. The inland movements associated with the seaborne journey are limited and confined largely to the port area. Sea-route operation also is used in many countries in which the inland infrastructure in not sufficiently developed and modernized to enable the movement of containers into the hinterland in large numbers or where there are administrative shortcomings, especially with regard to customs procedures, which have not yet been adapted to the needs of container transport. This situation is particularly predominant in developing countries.

Sea-route operation initially was implemented at the outset of containerization, when few ports, if any, were geared up to handle container vessels. The transition period in Europe and North America from sea-route operations to land-route operations was completed in a relatively short time. This was mainly due to the fact that the inland infrastructure already existed and only required updating to suit container requirements. Road and railway networks linked the major ports to their respective hinterland cargo catchment areas, and all that was required was the construction of handling equipment in the ports and rolling stock for the transport inland.

Sometimes political and economic constraints result in the cargo being stripped in the ports. Countries with large and cheap labor forces at its ports could find themselves with an additional unemployment problem if containers were positioned into the hinterland. The cargo lines' changeover from conventional tonnage to container vessels in itself resulted in a considerable reduction in the amount of labor required to handle cargo.

Once containerization makes its mark in a country, the sea-route or dock-to-dock operation is slowly replaced by the so-called land-route operation. In this operation the sea journey is of secondary importance compared with the preshipment and postshipment leg. Containers no longer remain in the port area but are transported inland with a minimum of delay. Frequently these containers move vast distances over land and may land on another continent before they are finally loaded aboard an ocean vessel. A prime example is the movement of containers from Europe to Japan via the Siberian Railway Line. This type of operation is exercised predominantly among highly developed areas—for instance, Japan, North America, and Europe. Land-route operation is known as "intermodal transport."

In international trade, intermodal transport technology can be employed at its best if the containers remain unbroken for as long as possible and, most important, if they are carried under multimodal transport arrangements. These 2 conditions have far-reaching implications for the physical infrastructure needed as well as for the administrative and political framework within which the operators act.

FIGURE 1 Extension of the Container Terminal Bremerhaven.

THE EUROPEAN PICTURE

Although Europe does not have 1.25-mi-long, double-stack liner trains 500 20-ft equivalent units in capacity criss-crossing the continent as does North America, intermodal development on the eastern side of the Atlantic has experienced some far-reaching advances during the past few years. The countries of the European Union have a collective population almost 50 percent larger than that of the United States, in an area nearly one-fourth the size of the latter. Distances between large cities, major production centers, seaports, and the hinterland are much shorter than those in the United States. Only 500 mi separate the continental ports of Hamburg and Le Havre. But within this small area lie as many as six potential hub container ports, all competing for the same customers. It is not surprising, then, that the implementation and practice of intermodality take different directions in Europe than they do in North America. The European road and rail networks are much denser, a reflection of the population-distribution pattern. Flexibility and frequency of service receive more attention from shippers and consignees than do economies of the long-distance haul; thus, the dominance of the 20-ft container in the European intermodal scene has its merit. The European

FIGURE 2 Bremen/Bremerhaven warehouse and container station.

geographic setting also dictates a different competitive arena for transport modes from that in the United States. In Europe, railroads must, and do, strive harder to gain a competitive advantage over trucks on the relatively short distances that characterize the average journey within the continent.

In continental Europe the most significant means of transport are by road and rail, with inland waterways coming in third. All 3 systems can be characterized by their advantages and disadvantages when referring to their ability to carry various types of cargo at different distances.

Originally the majority of containers were transported by road and only a few by rail. This initial constellation is underlined by a major U.S. carrier, whose principle was that every container should have a chassis. This led to investments few could afford. The line in question, however, had not taken into account the realities of the German transport structure. As a result of fiscal measures and the existing transport infrastructure, most of the general cargo transported over longer distances moves by rail, not by road. Although, in the first phase about 80 percent of the containers reached the hinterland by road and only about 20 percent by rail, the picture soon evened out to give an approximate 50:50 ratio. Toward the mid-1970s the trend reversed completely, and now almost 80 percent of containers that move over longer distances travel by rail.

This higher proportion of rail traffic can be explained by the railway system in general. Because of its size and technology, rail is the only mode of transport that, on a long-term basis, is able to solve the quantitative problems of container transport to and from the hinterland. For instance, a third-generation container ship may land up to 1,000 containers that have to be transported into the hinterland within 48 hours. Only the railways are in a position to fulfill such a service. In general, experience has shown that in Germany the break-even point between road and rail transportation lies at a radius of about 170 to 250 km from the ocean terminal.

Time savings is an important factor in multimodal transport. In North America some container terminal

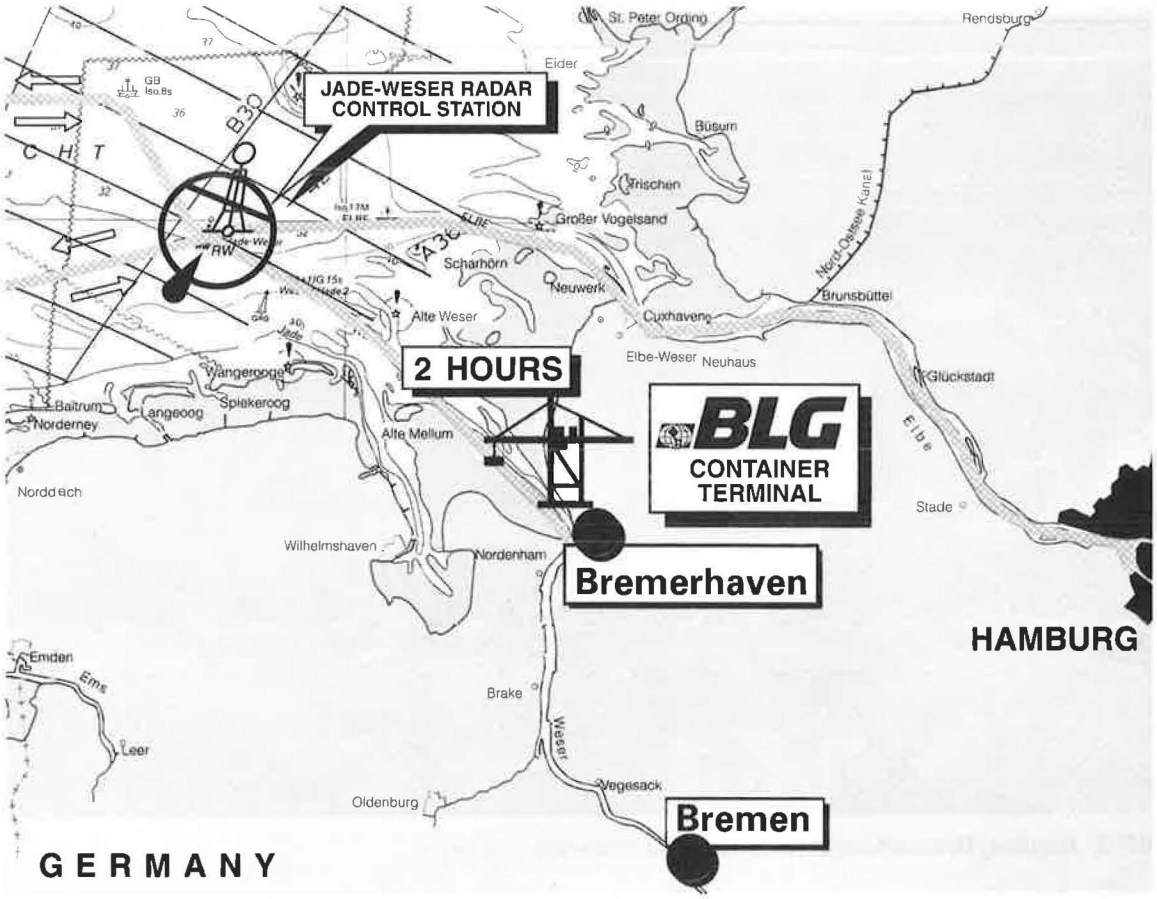

FIGURE 3 The ideal open sea access.

operators are unable to handle rail block trains at their own facilities. This means that after discharge, the containers must be trucked to the nearest railway terminal, which may be more than 20 mi away. This not only results in an overall increase in costs but also increases total transit time.

The introduction of containerization emphasized the fact that a port that is not accessible to a major railway system is seriously handicapped in the competition for intermodal traffic, and the issue has become even more specific. The distance of the railway terminal from the port is now a critical factor, and even a few km in favor of one port over another can prove decisive.

In Europe nearly all ocean terminal operators have rail sidings that lead directly into the container terminal so that the block trains are handled right there, where the box comes off the ship. In Bremerhaven, for example, a container discharged in the late afternoon can be on its way by rail 1 hr later and arrive at its final consignee in southern Germany early the next morning. Likewise, export containers leaving the inland place of packing in the afternoon arrive at the port the following morning. This, by the way, is nothing new and was already possible back in 1969.

Following the trend in Germany to transport containers by rail over long distances, the state-owned German railways responded by introducing special, container-only, block liner trains between the seaports and the inland. Because a high percentage of larger shippers and consignees are equipped with rail sidings, the positioning of their containers by rail is not a major problem. There are, however, many customers of no less importance who, until fairly recently, handled their cargo exclusively by road.

The solution was found in opening up inland container depots at strategic locations in major industrial areas. Initially goods railway stations were implemented and equipped with special container-handling gantry cranes. These stations are slowly being substituted with customer-designed container depots.

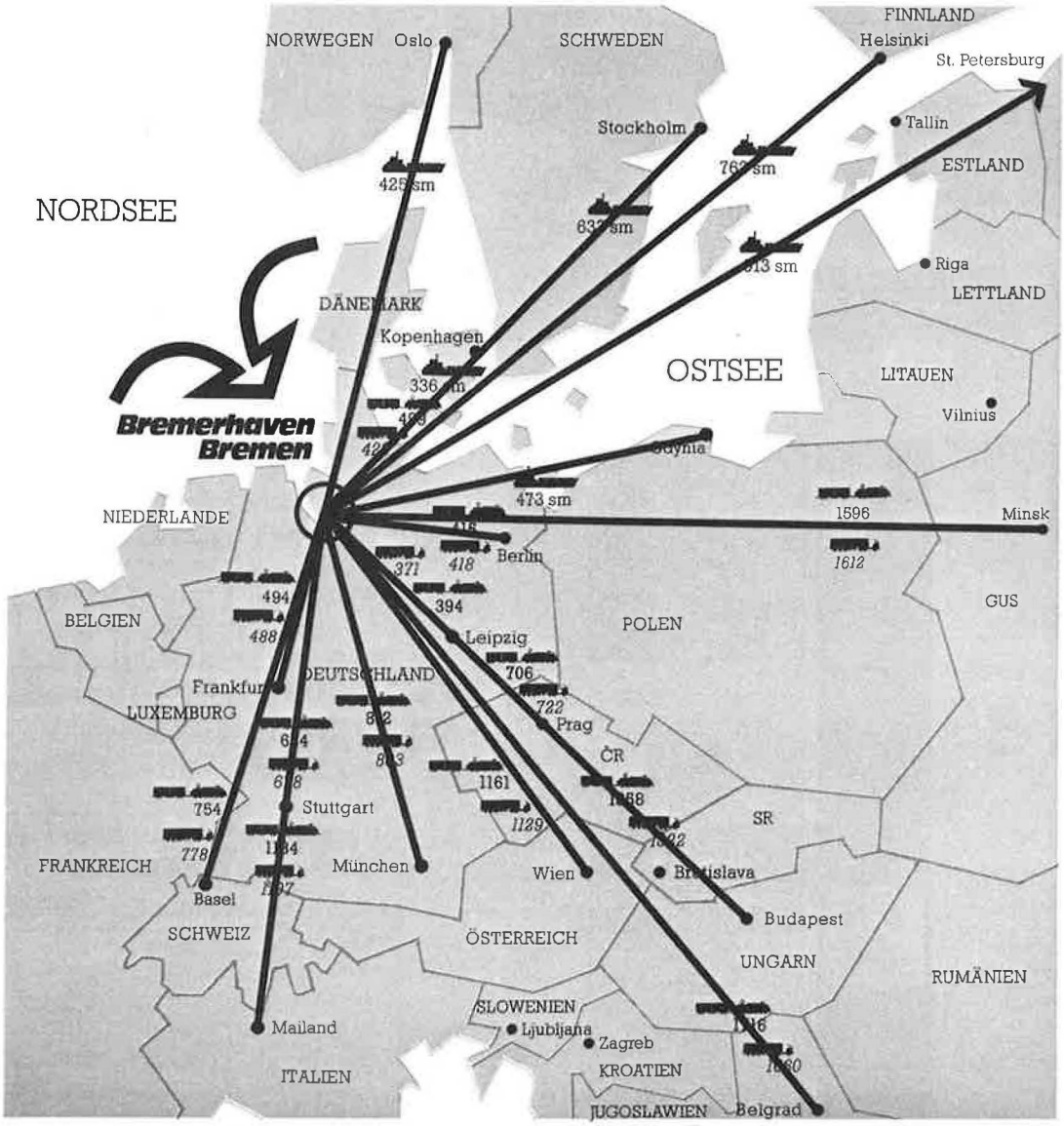

FIGURE 4 On carriage distances from Bremen/Bremerhaven in km.

Customers can be offered a combined transport system that, although in no way is new, is capable of offering a competitive service to the sole truck transport. The principle is that the container is transported to the nearest inland terminal by rail. It is then transferred from the railcar to a road chassis and delivered to the customer by truck. After stripping or stuffing, the container is trucked back to the inland terminal and either transferred from the truck to a railcar for transport for the major distance back to the ocean terminal or, if empty, stored at the depot until it is required for an export shipment. The ability to store empty equipment at an inland depot in the industrial hinterland is an important factor in the overall intermodal transport cost calculation. A conservative estimate several years ago stated that at least $1.5 billion were being spent every year on repositioning empty containers.

With the optimization of the container movement by rail and the ever increasing use of inland depots, trucking organizations are tending to concentrate their activities on short-haul movements. These not only are

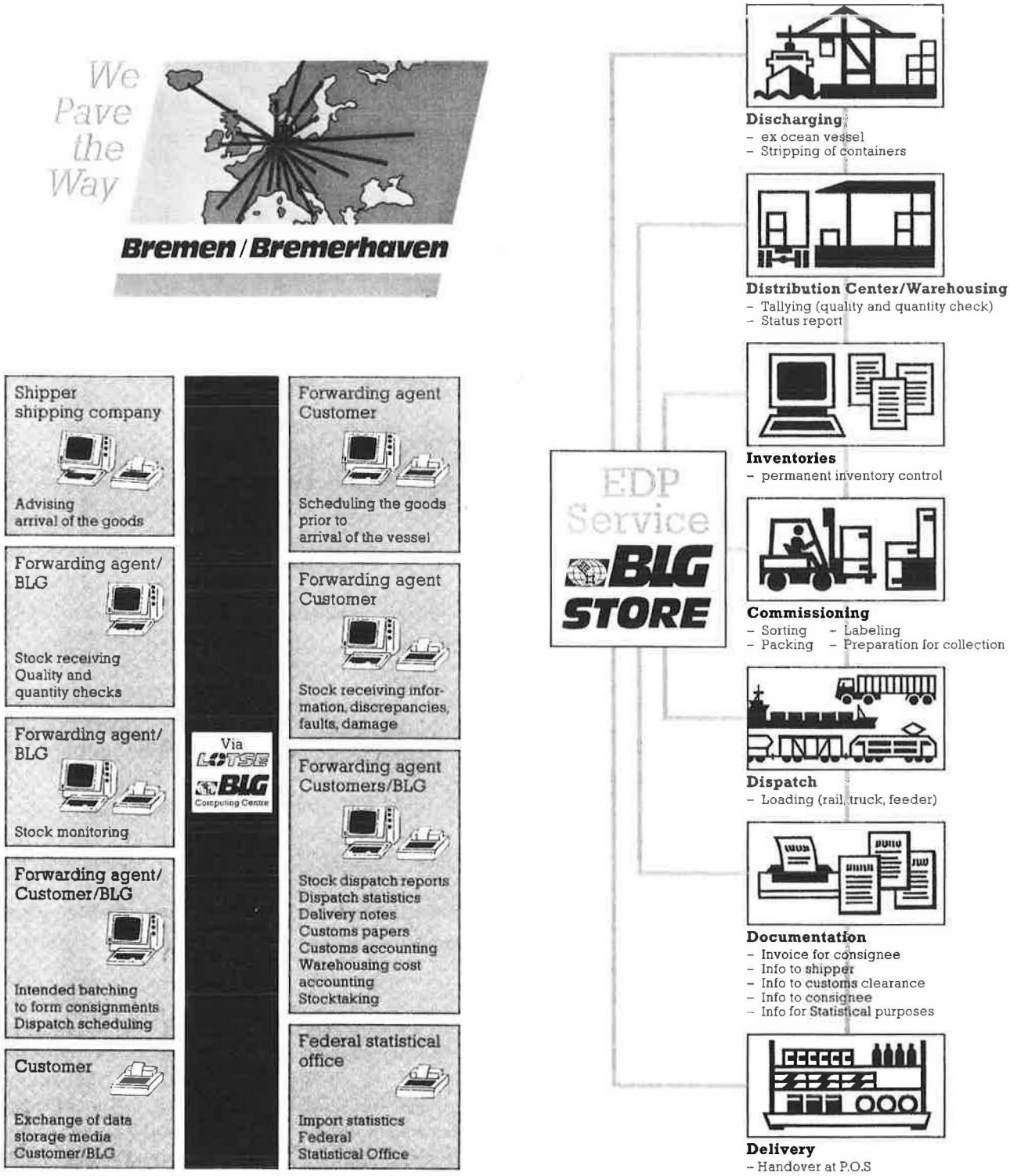

FIGURE 5 BLG distribution services.

being carried out in the locality of the port but also in the hinterland. Here the containers are being transported for the major distance by rail. At the inland depot the containers are transferred to chassis for local

This integrated EDI-network of computer systems of the transport industry, authorities and carriers offers customers active monitoring of orders and loading with event-controlled status information based on one link.

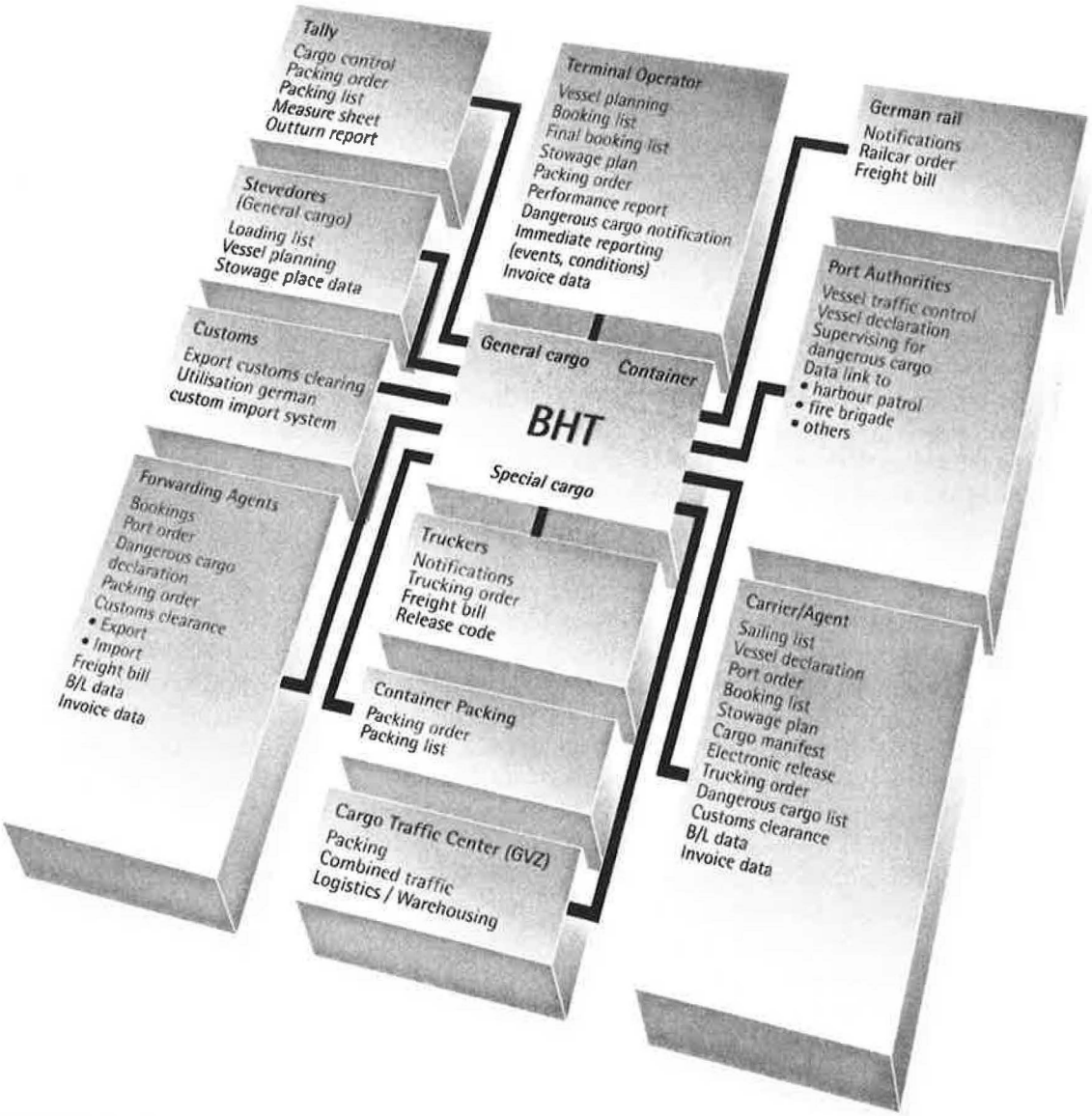

FIGURE 6 Bremen Harbour Telematics services.

delivery to customers. More and more truckers are establishing themselves in the inland to carry out local short-haul moves. In addition, more containers are being transported inland by barge. The majority of the

containers must be transferred from the barge at the inland depot and then positioned by road to the final consignee.

Although double stack railcars are not currently being used in Europe because of the height of bridges and tunnels and because of overhead electrical cables, intermodal transport is active, not only with containers but also with so-called swop-bodies and piggyback transport.

Combined rail/road transport in western Germany has been growing steadily for 2 decades, whereas total railcargo volume has been declining, prompting rail experts to search further for the ideal road/rail system. This ideal system may well have been found in the road-railer system, which was developed in the United States and which, after a slow start, has become popular for domestic transport. This system has now caught on in Europe.

Until recently the system was restricted to complete units, in which the special chassis was permanently secured to the main body. Recently a detatchable chassis has been constructed, which enables the transport of swop-bodies or marine containers, thus opening up an alternative mode for European container transport.

In North America nearly all major shipping lines are operating intermodal rail services. Some have even gone as far as purchasing their own double-stack railcars and are offering regular block train services between the Mid-West and the East and West Coasts.

This has resulted in the liner operators realizing that intermodal services no longer give them a competitive edge. As a result, they are shifting their strategies. During the past 2 years, many liner operators have shifted away from providing multimodal services to focus on improved efficiency, rationalization of operations, and quality. What was once a marketing advantage is now an expected part of the transportation package. The trend seems to be away from developing more costly intermodal services and toward a more defensive posture of controlling costs. This does not mean that the lines are losing interest in intermodal transport but instead that there is a trend toward forming partnerships or cooperative deals with inland transportation specialists.

The shipowner of today offers a total transport concept, which means that the quality of services offered by a port and the connecting transport system directly effects the competitiveness of the port but also the shipowner. Port operators of today have to offer more than just a berth, labor to discharge and load the vessels, and storage space. Now more than ever, they have to get involved in matters that sometimes only indirectly pertain to their ports operation. The total service package a port is able to offer can be the factor that determines whether a potential shipping line calls at that port.

This fact is particularly prevalent in northeast Europe, where the close proximity of many terminals results in terminals trying to outdo one another. Furthermore, extreme flexibility is frequently called for and, although sometimes financially imprudent, there are no alternatives if one wishes to remain in the top group of terminals and not be relegated to a feeder port.

The container is an integral part of the modern vessel. With its implementation, the oceangoing vessel now not only reaches the port but also the hinterland. As a consequence, some port functions have been transferred to the hinterland.

A sea terminal that specializes in container handling has become a single point of rapid transit, a link in an automated chain of handling, and the natural interface between sea and land transport. Many ports see their traditional functions as warehouses, markets, and retail processing and distribution centers become less important. These functions have been transferred to the hinterland.

An exception to this can be observed in the twin-port Hanseatic State of Bremen, which has a unique geographic advantage over its competitor ports in the Hamburg-Bordeaux area. Bremerhaven, on one side of the port, with its largest, enclosed container terminal in Europe, is the most northerly port in Germany, located on the coast. Bremen, on the other side, is the most southerly and is located in the hinterland. In this case, the single port operator in Bremen and Bremerhaven, the Bremer Lagerhaus-Gesellschaft, is able to expand its warehouse, market, and retail processing and distribution centers and thereby can attract additional trade and commerce.

The fact that cargo is moving inland means that the shipowner's interest in the cargo no longer ceases once the cargo has been discharged from the vessel, which was in the case with conventional traffic. The shipowner takes on a responsibility that only ends when the cargo has been safely delivered at the consignee's warehouse. The shipowner must take into account the service package, the infrastructure, and the connecting transport systems offered by a port. Because the shipowner offers a total transport concept, the quality of the services offered by a port and the connecting transport system directly effects the competitiveness of not only the port but also the shipowner. The port operators of today have to offer more than just a berth, labor to discharge

and load vessels, and storage space. They have to get deeply involved in matters that sometimes only indirectly pertain to the port's operation. The total service package a port is able to offer can be the factor that determines whether a potential shipping line calls at the port.

The extent of a port's hinterland catchment area is not primarily governed by geographic but by economic factors. Only in exceptional cases can a port's hinterland be determined by geographic criteria in that the port serves all inland points that are situated closer to it than to any other port. The fact that there are different ports within reach of an inland point and various modes of transportation available to the shipping line affects the decision about which port to use.

The availability of various modes of transport to inland points is a technical precondition enabling a port to serve the traffic demand of its hinterland. The standard of land communication is one of the economic factors affecting a port's competition and therefore is of vital interest to every port.

The Port of Bremerhaven has a vast catchment area covering Scandinavia to the north; Central and Eastern Europe to the east; and Switzerland, Austria, and Italy to the south—a market potential of well more than 400 million people. The geographic position of Bremerhaven in relation to this area is so advantageous that Rotterdam, for instance, has only been able to capture a 20-percent share of this lucrative market. The primary reason for this is the shorter and faster intermodal transport routes the Port of Bremerhaven in cooperation with the national and international railway operators is able to offer. Because of the forthcoming privatization of German railways, our transportation sister company, Service Center Logistic (SCL) Transport, is taking the initiative and dealing more with new private-sector operators, which are expected to offer even better services at competitive prices. This should result in an increase in the market share of rail transport, which up to recently has been losing ground to truck transport. Despite this fact, the volume of rail traffic via Bremerhaven is high, with trains arriving and departing around the clock. One reason for this is the on-terminal railway station with rolling stock always available and the possibility to have a container rolling in less than 1 hr after discharge from the ocean vessel. Without the state-of-the-art technology, which is evident in Bremerhaven, the optimal handling of traffic would be almost impossible.

Computer technology has reached a stage so that even the 19 gantry cranes and the 64 straddle-carriers are linked to the terminal operation's computer system. The system not only documents movements but also optimizes the work load, which automatically leads to higher productivity and lower costs. This type of technology is necessary when one is handling the receiving and delivery of containers on 9.4 km of railway track and 44 truck transfer bays simultaneously.

The 2.2-km-long terminal pier is equipped with 14 gantry cranes with sufficient flexibility to enable five cranes on a single vessel to work simultaneously anywhere on the pier. Five additional gantry cranes serve the eastern part of the terminal inside the locks. Following extension of the outer terminal by 700 m, five more post-Panamax cranes will be installed, bringing the total of such cranes to nine. The extension will add on 800,000 m^2 handling and storage base, giving a total area of 2.4 million m^2. The 12 on-the-dock rail tracks for unit trains, therefore, will have a total length of 13.6 km. The six CTII/CTIII tracks will be arranged in a loop, enabling arrival at the terminal from the north and departure from the south. This will allow the arrival and departure of complete block trains without the need for shunting or repositioning. This will result in a considerable amount of time saved for the railways and will likely be reflected in lower transport rates and faster deliveries to customers.

Keeping customers' cost savings in mind, SCL operates a twice-daily economical motor barge service between Bremen and Bremerhaven. The containers are not only handled at the main Bremen terminal. A real house/house service is offered to customers, which have their own riverside facilities. In addition, SCL is operating a container shuttle between the ports of Hamburg and Bremerhaven. This covers any Hamburg cargo carried by lines that only call at the hub port of Bremerhaven.

Being a hubport, Bremerhaven is served by a large fleet of feeder vessels, which connect the terminal to at least 11 other European countries. The feeder traffic represents about 23 percent of total volume handled. In addition, the ports of Bremen and Bremerhaven offer a full range of distribution services. This is a trade sector that is coming more to the forefront.

SUMMARY

- As containerization continues to gather momentum in developing countries, the need to expand areas of transport beyond immediate port areas becomes apparent. This move will help ease the chronic

congestion problems that beset many young container ports.

- Multinational organizations dealing in energy will continue to increase fuel prices; therefore, everyone along the transport chain will have to minimize energy consumption by giving priority to energy-efficient transportation means. Railways have a distinct advantage because they are able to use the entire range of primary energy sources: coal, oil, gas, hydraulic, and nuclear. The latter is made available for overland transport in the form of electricity, which the railways alone are capable of using economically on a large scale. Other modes of land transport cannot, except in extremely marginal cases, use anything but petroleum products. It is difficult to envisage any shift or change in this situation.
- Truck transport always will be required, especially in developing countries in which frequently the only means available to reach customers is by road. Trucking companies will concentrate on short-haul movements for distances up to about 200 km from the port. It is expected that they will increase their presence inland by offering local drayage to and from inland waterways and railway depots. Thus the inland barge operators and railways will concentrate on the main-line haul, whereas the truckers will carry out local pickup and delivery.
- Wherever inland waterways are available, one can expect a continued increase in the use of barge transport, even at the cost of additional transit time. The overall cost savings from using a for a well-organized barge transport will lead to this development.
- Feeder services are also expected to register an increase in volume, via the major ports, over the average trade increase, primarily because shipping lines are forming consortia, increasing the size of vessels, and reducing the number of ports of call.
- With the ever increasing number of post-Panamax vessels in service or on order, the trend toward Hub ports will increase.
- With a high percentage of the ocean freight rates down to a 15-year low, the lines will be fighting to increase rates and reduce overall operating costs.
- Electronic data interchange (EDI) will have to be optimized among shipping lines, their customers, agents, and port operators. The data must move ahead of the container and not lag behind as in the past. EDI and the one-time, online input of data along the transport chain, which will link all parties concerned, will result in immense financial savings.
- If a port expects to be considered a hub port, it will have to invest in additional gantry cranes capable of handling Panamax vessels as well as other sophisticated equipment required to enable fulfillment of the lines' requirements. Many ports also will have to consider additional dredging of port approaches to enable larger vessels to arrive and depart during any stage of the tide. Ports will continue to improve their logistical service packages, enabling the lines and agents to dispose of containers inland in an optimal manner, thereby helping reduce the overall cost of operating an intermodal transport system.
- The Bremer Lagerhaus-Gesellschaft took all these and many other facts into account when it decided to break from the traditional jobs of just handling vessels and storing cargo in the port. These services remain important; however, they are just part of the total service package being offered by ports today. Innovative steps were taken that, until recently, were unusual for a terminal operator to take.

The shipping lines' and their customers' need for the expertise of professionals who are able offer complete logistical solutions to their problems, had to be handled. This involved among other things:

- Entering into joint ventures with companies, for example, in the fruit and tobacco industry.
- Planning, construction, and financial participation in the inland container terminal in Dortmund, which now operates a regular service linking the German interior with Bremen and Bremerhaven.
- Worldwide consulting with our daughter company, Port and Transport Consulting.
- Rapid expansion of our distribution facilities in Bremerhaven and Bremen offering the logistical know-how and backup required to operate efficient "just-in-time" delivery services to numerous customers.
- Formation of the daughter company, SCL, which opened the door to multimodal transport. With a staff of professionals from the industry, inland transport is no longer a gray area that the port is unable to influence. Today it is the opposite. Through optimal planning of block trains, interport shuttles, and local deliveries in the European interior, the company has been able to route cargo via the port not only at competitive rates but also often at reduced transit times. This cargo until recently often was moved via other ports.
- A port that intends to keep abreast or even ahead of its competitors needs advanced data processing and communicating systems that are fully capable of corresponding with their customers' EDI systems. In Bremerhaven, EDI and online connections to the terminal computer system is available to lines and

agents. Furthermore, we are playing a major role in the development and implementation of the EDI system, EDIFACT. A number of other interchange systems being implemented depend mainly on the shipping lines' requirements. Not only the lines but also the shippers and consignees are becoming increasingly interested in the status of their containers and goods. Railcars, for instance, can be monitored from the factory floor to the agent's display rooms and everywhere in between. With the step "out of the port into the hinterland," the port not only is securing its present market share but also is increasing the size of its catchment area and thereby adding additional security for investments that, if not already in the pipeline, are sure to come in the future.