Establishment of containerisation in the D.P.R. of Korea

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WORLD MARITIME UNIVERSITY

Malmo, Sweden

ESTABLISHMENT OF CONTAINERISATION IN THE D.P.R OF KOREA

by

RYOM CHANG HYOK
THE D.P.R. OF KOREA

A paper submitted to the Faculty of the World Maritime University in partial satisfaction of the requirements for the award of a

MASTER OF SCIENCE DEGREE

IN

GENERAL MARITIME ADMINISTRATION

The contents of this paper reflect my personal views and are not necessarily endorsed by the University.

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Ryom Chang Hyok
INTRODUCTION

Containerisation is the modern contribution to the historic trend of reducing transport time and costs and is, therefore, unavoidable. The container brings with it possibilities for improving international trade. Consequently more and more developing countries are investigating the possibility of establishing container systems, or taking steps to set up intermodal systems to keep up with the developments in international cargo transport and world trade.

Most developing countries have seen dramatic growth in containerised traffic through their ports. Container experts predict that this growth will continue. Even though the establishment of a container system is very expensive, the containerisation has many advantages.

The containerisation has proven in its brief history that it can offer significantly more efficient and effective transport to its comprehensive nature. A container system permits door-to-door service which from the industry production site to the wholesaler’s store may be an overall distance of 10000 km.

Certainly one of the greatest advantages is that there is no intermediate handling at terminals and it permits faster transits, a reduced risk of cargo damage, and a much lower risk of cargo pilferage. These advantages permit the cargo to arrive in better condition at its destination than that of uncontainerized shipments.

Containerization offers considerable savings in time and money because of quicker turn round in ports by faster cargo handling.

Every country wanting to establish or to continue its participation in the international shipping industry has
no other choice but to establish its own container system.

In the DDR of Korea, the container transport by sea is not fully achieved whilst the container transport by rail has been developed since the 1970s. It is because, in the past decades, the foreign trade of DDR of Korea has largely depended on China, the USSR and most Eastern European Socialist countries by railway transport.

However, the DDR of Korea recognised that in order to briskly penetrate the international trade and shipping service market, it is essential to establish a conformity with the development of the national economy and the expansion of foreign trade step by step.

In my opinion, the containerization is the most comprehensive and efficient cargo transport system available serving the world trade.

The principal objective of this paper is to give a general idea of how to establish and what is require for a container system in the DDR of Korea as well as most developing countries.
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CHAPTER I

PRESENT STATUS OF CONTAINER TRANSPORT IN THE D.P.R. OF KOREA

1.1 EVOLUTION OF CONTAINER TRANSPORT

The Government of the DPR of Korea has given great importance to the railway transport since the 1960's. At that time, the foreign trade of the DPR of Korea was largely dependent on the railway transport with China, The USSR, the Eastern European Socialist countries. The DPR of Korea mainly exported raw materials and semi-finished products and imported machinery and general products. Therefore exported goods did not need to be transported by containers, but in the case of imported goods were transported by containers. Consequently it was very difficult to send the containers. Almost all containers came from abroad and had to be kept at least 3-5 months at the central railway stations in the DPR of Korea. Considering that 80 percent of exported goods did not need to be transported by containers whilst most imported goods were transported by containers. The DPR of Korea had to send back many empty containers.

According to the development of the national economy many containerisable products were produced. Accordingly, the problem to send back empty containers could be largely reduced.

On the other hand, according to the trade expansion with more than 100 countries there was a necessity to a container terminal.

In the early 1970's a container terminal was constructed at the Nampo Port which is 6 square
kilometres, 150 metres long and 12 metres deep. Since then the container transport by sea has slowly been developing in comparison with other shipping industries as well as the national economy.

Perhaps the reasons from my own point of view are as follows:

a) Still many exporting and importing companies tend to rely on the railway container transport in the case of which they export and import to/from China, the USSR, the Eastern Socialist countries and also Western European Capitalist countries.

b) The quantity of exporting and importing goods to be carried by containers to/from those countries which are mentioned above is higher than the other countries.

c) Dislinkage from port to hinterland is also one of the reasons. Most of the railway has a single track and road conditions are not enough to carry international standard containers by trucks. Because the territory of the DPR of Korea is more than 75 percent mountainous it is very difficult to construct a double railway and also to expand and concrete the roads which have 75 cm to 1 metre of ice in the winter.

d) Because there are no container ships in the DPR of Korea export and import companies have to charter container vessels from foreign countries. In this case they have to pay 100 percent foreign currency to foreign shipowners. But if they carry their import and export goods by railway, according to agreement between socialist countries they may pay only in national currency to the foreign railway companies. Therefore, many export and import companies tend to transport their goods by railway.
In comparison with the container transport by sea, the container transport by railway is more developed.

As mentioned above in the DPR of Korea there is only one container terminal at the Nampo Port which is the biggest port in the DPR of Korea. The equipment and facilities at this terminal are not sophisticated and their utilization is not high. Sometimes there is no loading and unloading because of lack of containerised cargo and container vessels.

Therefore, the container transport by sea is at a lower level compared with other shipping industries.

1.2 PROBLEMS FACED BY THE DPR OF KOREA IN THE ESTABLISHMENT OF CONTAINERIZATION

1.1.2 Dislinkage between port and hinterland.

The container system has largely changed the traditional function of modern ports.

A port previously considered as a terminal stage in either sea and land transport means of goods, has become a link in the chain of container transport from the door of the supplier to the door transport service, the inner construction of the port and its outer land approaches need to be set up according to the requirements of this system.

It means that the appropriate infrastructure of containerization such as a wide inland transport network—both road and rail network—must be established, otherwise the huge capital investment committed to mechanise cargo handling and all container ways of transport would produce losses and failures.

The whole philosophy behind containerization is the packing of cargoes into uniformly sized boxes (containers)
and designing all carrying vehicles (road, rail and ship) for the rapid and efficient transport of these containers, ideally from door to door.

In the case of the DPR of Korea the use of road, rail and ship in an integrated and inter-connected transport system is not feasible.

The introduction of containers allows railways to take greater advantage of the strong points of the rail system and to eliminate or at least reduce the impact of its shortcomings. This can be achieved by both technological and organizational adaptation to the needs of the container, the organizational aspects being the most important.

As the cost of the railway transport differ widely from country to country, or even from trade to trade, it is impossible to make general valid estimates of the absolute cost level per unit of transport. However, an indication of the feasibility of the rail transport can be given by comparing its cost structures to those of the main competing mode i.e. road transport.

In view of the rising cost of petroleum products, the problem of optimum use of the existing resources has become a vital one, especially for the developing countries.

The question whether the carriage of containers by rail, as compared with road transport, results in reduced energy consumption can not be answered in a general way but mainly depends on the load factors attained.

In the case of the DPR of Korea, the situation is different.

The most difficult problem regarding the container transport by rail is that almost all railways in the DPR of Korea have single tracks therefore cargo congestions
continuously take place in the central railway stations.

Considering that the territory of the DPR of Korea is very mountainous it is very difficult to construct a double railway. Without construction of a double railway the problem of dislinkage from port to hinterland can not be solved. It needs huge amount of costs to construct double railways.

In the case of road transport the situation is the same. In addition to above mentioned difficulties the earth is covered with ice nearly 1 metre in the winter time. Therefore, huge amounts of money are needed to construct and expand the roads.

This inevitably results in the fact that containers have to be filled and emptied in the vicinity of the port area. The fact that containers have to be emptied in the vicinity of the port area instead of at the final destination of the purchasers, leads to the increase of handling costs per ton of cargo, and makes the containerization system less competitive than bulk transport.

1.2.2 CONTAINER IMBALANCE

Container imbalance is because of the imbalance between the exporting goods and importing goods which are containerizable. As already mentioned, the DPR of Korea mainly exports raw materials and semi-finished products while they import containerized goods.

1.2.3 NON-PRODUCTION OF CONTAINERS AND CONTAINER SHIPS

Because containers are not produced in the DPR of Korea, all exporting and importing companies have to buy containers or hire containers from abroad. The same situation applies in the case of container ship.
1.2.4 LACK OF NATIONAL LEGISLATION

There is no strict national legislation to control a container system. So far the administrative organizations of container transport have simply been incorporated in an existing organization which deals with all cargoes transported by sea. Therefore, in my opinion, a separate organization should be established as well as a national legislation for container transport by studying international standards and conventions, such as the Multimodal Transport Conventions, Hague/Visby Rules, etc, and by training lawyers and container specialists through their participation in international meetings, workshop and through discussion with foreign experts.
CHAPTER II
CONTAINERS SPECIFICATIONS

2.1 DEFINITION

Without the international agreement on the basis of specifications and dimensions of the containers, the container transport system could never have developed to its present level.

According to the International Convention for Safe Containers, 1972 (CSC) the definitions concerning the containers are as follows:

1. "Container" means an article of transport equipment;

   a) of a permanent character and accordingly strong enough to be suitable for repeated use,

   b) specially designed to facilitate the transport of goods, by one or more modes of transport, without intermediate reloading,

   c) designed to be secured and/or readily handled, having corner fittings for these purposes,

   d) of a size such that the area enclosed by the four outer bottom corners is either:
      . at least 14 sq.m. (150 sq.ft.) or,
      . at least 7 sq.m. (75 sq.ft.) if it is fitted with top corner fittings, the term "container" includes neither vehicles nor packing, however, containers when carried
on chassis are included,

2. "Container fittings" means an arrangement of apertures and faces at the top, and/or bottom of a container for the purposes of handling, stacking and/or securing.

3. "Administration" means the Government of a Contracting Party to CSC under whose authority containers are approved.

4. "New container" means a container the construction of which was commenced on or after the date of entry into force of CSC.

5. "Type-series container" means any container manufactured in accordance with the approved design type.

6. "Prototype" means a container representative of those manufactured in a design type series.

7. "Tare Weight" means the weight of the empty container including permanently affixed ancillary equipment.

8. "Approval" means the decision by an Administration that a design type or a container is safe within the terms of CSC.

2.2 TYPES AND DIMENSIONS OF CONTAINERS

Containers can be grouped under six principal type:
a) General cargo container:
A closed container with doors at one end, closed with sides and doors at one end, open-tops, open-sided, open top open sided, open-sided open-end, half height containers, ventilated (not insulated) container.

Figures from 1 to 10

b) Thermal Container:
Insulated, refrigerated, and heated containers (Fig 11)

c) Tank Container:
Bulk liquid and compressed gas (Fig 12)

d) Dry Bulk Container:
For gravity discharge and pressure discharge (Fig 13)

e) Platform Container:
Essentially "flats" without any superstructure, and not belonging to a fully automated container system since they cannot be top-lifted when loaded.

f) Special Container:
Cattle container, and collapsible containers.

The dimensions of containers are various but it is commonly held that containers are built in two sizes namely, 20' and 40'. Nevertheless, the Americans have their own system of 35', but generally it is 20' and 40' for the rest of the world. The specifications regarding the
dimension of containers can seen in figures 1 to 13.

2.3 DESIGN AND MANUFACTURE

"Containers are built for abuse, not for use" is an internationally coined statement but excused by its motive.

The truism is that containers must protect their varying contents against damages intermodal transport can cause. Containers should therefore be of strong construction, resistant to denting, abrasion, building out and wedging when stacked in the holds of ships and have ample strength to repeatedly endure transport and handling by different kinds of equipment.

The basic design requirements of containers can be found in the International Standards Organization (ISO) Draft Recommendation No. 1496, "Specification and Testing of Series 1 Freight Containers". The recommendation leaves the manufacturers ample freedom to individualise design details and choice of materials.

In order to make sure that a container has been produced to the standard, it has to be proved that its structural calculations are correct and that it can withstand strength testing. Because of this reason, classification societies, engage in the certification of containers, granted on the basis of conformity to an approved type, and have established very strict regulations and procedures, mostly based on ISO recommendations.

There are three categories of materials used to fabricate containers namely; plywood/fiberglass, aluminium and steel.
2.4 REGULATIONS FOR THE TESTING, INSPECTION APPROVAL AND MAINTENANCE OF CONTAINERS.

These regulations are based on the international Convention for Safe Containers, 1972 (CSC). My country is not a contracting party to this convention.

2.4.1 SAFETY APPROVAL PLATE

A Safety Approval Plate must be permanently attached to every approved container at a readily visible place, adjacent to any other approval plate issued for official purposes, where it would not be easily damaged.

The plate should contain the following information in at least English or French:

'CSC SAFETY APPROVAL'

- Country of approval and approval reference
- Date (month and year) of manufacture
- Manufacturer's identification number of the container or in the case of existing containers for which that number is unknown, the number allotted by the Administration
- Maximum operating gross weight
- Allowable stacking weight
- Transverse racking test load value.

A blank space should be reserved on the plate for insertion of end-wall and/or side-wall strength values (factors) and for the first and subsequent maintenance examination dates when used. The presence of the safety
approval plate does not remove the necessity of displaying such labels or other information as may be required by other regulations which may be in force.

The Safety Approval Plate should take the form of a permanent, non-corrosive, fire-proof rectangular plate measuring not less than 200 mm by 100 mm. The words 'CSC Safety Approval' of minimum letter height of 8 mm and all other words and numbers of a minimum height of 5 mm should be stamped into, embossed on or indicated on the surface of the plate in any other permanent and legible way.

CSC SAFETY APPROVAL

(GB-L/749/2/7/75)

DATE MANUFACTURED

IDENTIFICATION NO.

MAXIMUM GROSS WEIGHT KG  LB  100 MM

ALLOWABLE STACKING WEIGHT KG  LB

FOR 1.86 KG  LB

RACKING TEST LOAD VALUE KG  LB

200 MM

2.4.2 MAINTENANCE AND EXAMINATION

The owner of the container is responsible for maintaining it in safe condition. The owner of an
approved container examines the container. The date before which a new container undergoes its first examination is marked on the Safety Approval Plate. The date before which the container is re-examined should be clearly marked on the container.

2.4.3 DESIGN TYPE APPROVAL

In the case of containers for which an application for approval has been submitted, the Administration examines and witnesses testing of a prototype container to ensure that the containers conform with the requirements.

2.4.4 PROVISIONS FOR APPROVAL BY DESIGN TYPE

Where the container is to be manufactured by design type series, application made to an administration for approval by design type is accompanied by drawings, a design specification of the type of container to be approved and such other data as may be required by the Administration.

The application is accompanied by an assurance from the manufacturer that he will:

a) produce such containers of design type

b) advice the Administration of any change in the design or specification and await its approval before affixing the Safety Approval Plate to the container

c) affix the Safety Approval Plate to each container in the design type series and to no others
d) keep a record of containers manufactured to the approved design type

This record should contain the manufacturer's identification numbers, dates of delivery and names and addresses of customers to whom the containers are delivered.

Approval may be granted by the Administration to containers manufactured as modification of an approved design type if the Administration is satisfied. The Administration does not confer on a manufacturer authority to affix Safety Approval Plates on the basis of design type approval unless satisfied that the manufacturer has instituted internal production-control features to ensure that the containers produced will conform to the approved proto-type.

In order to ensure that containers of the same design type series are manufactured to the approved design, the Administration examines or tests as many units as it considers necessary, at any state during production of the design type series concerned.

The manufacturers notify the Administration prior to the commencement of production of each new series of containers to be manufactured in accordance with an approved design type.

Approval of individual containers may be granted where the Administration, after examination and witnessing of tests, is satisfied. Then the Administration notifies the applicant in writing of approval and this notification entitles him to affix the Safety Approval Plate to such containers.
2.4.5 APPROVAL OF NEW CONTAINERS NOT APPROVED AT THE TIME OF MANUFACTURE

If, on or before September 6, 1982, the owner of a new container which was not approved at the time of manufacture presents the following information to an Administration:

a) date and place of manufacture

b) manufacturer's identification number of the container if available

c) maximum operating gross weight capability

d) evidence to the satisfaction of the Administration that the container was manufactured to a design type which had been tested and found to comply with the technical conditions

e) allowable stacking weight

f) such other data as required for the Safety Approval Plate.

2.5 CONTAINER SERVICES

Since the introduction of container services in the early 1960's the container transport has been growing and nowadays the loaded containers moved in deep-sea trades are of the order of more than 5 million 20 ft equivalent a year.

This development has mainly been in the trades between industrial countries. Often between 70% and 90%
of the liner cargoes on these trades is now travelling in container services i.e. containerization is reaching a saturation point.

In the composition of world container ship fleet, it can be seen that the majority of container ships are cellular, which have proved most economic for the trades containerized so far. Nevertheless, the number of ships which partly carry containers suitable size for deep sea container service is the increase, reflecting the practicality of using such ships at least for a transitional period. This would be one of the options for developing the country’s trades.

In the case of the DPR of Korea, less than 10% of all cargoes are carried by containers. Most of them are carried by rail but a very small quantity of the containers are carried by sea. Furthermore, there are no container ships and adequate port terminals as well as container handling facilities whilst the container transport by rail has developed more modern equipment (though not fully equipped).

In these circumstances the following problems can be noticed:

a) services on trades with developing countries do not need to be a mirror image of the large scale services run with highly specialised equipment, which is the case in a number of the trades between industrial countries

b) trades in the industrial countries are now generally used to container services in trades with industrial countries and are likely to welcome such services with developing countries where they are available
The competitive ability of a developing country is therefore maintained or even enhanced where such services exist.

Container services are also likely to be cost effective since handling costs by conventional means in the industrial countries are high and a relative cost reduction is achieved through container handling.

c) gradual adoption of container services in developing countries is possible and indeed may be desirable. Not all trades have to be developed at once. Further, where developments are made, it may be appropriate to begin with relatively unsophisticated equipment and step up scale as time goes on and experience is gained.

A container service does not have to be a full through transport service at the developing country end of the trade. If inland transport conditions are difficult, containers can be packed and unpacked at or near the port and other benefits of containerization be retained. As inland transport facilities are improved the through transport aspect of the container service within the developing country concerned can then be taken up.

d) To transmit is a method of getting cargo into containers in cases where a direct service does not exist. The system may be a useful transitional stage to full container service or may be helpful where particular congestion factors have arisen with break-bulk cargo. For instance, it has been worthwhile shipping break-bulk cargo from India to the UK and transshipping it by container to West Africa in order to arrive there
in container form.
CHAPTER III

CONTAINER SHIPS

Since the container transport was introduced in the world trade market, containerization has been developed step by step. This transport system is being introduced in many developing countries.

Nowadays the world fleet of deep sea going general cargo ships consists of the proportion of approximately 10000 tramps and liners of over 4000 dwt, which carry bulk and semi-bulk cargoes and some general cargoes but have limited container capacity together with some 1500 specialized container carriers and flexible ships. However, it is clear that the container carrying ships will be increased as in the past decades as well as in the future.

In this chapter I am going to describe the types of container carrying ships, both specialized container carriers and flexible ships.

Ships that carry containers can range from the full container ship to the convertible container type.

3.1 FULL CELLULAR CONTAINER SHIP

A full container ship is a single purpose vessel with arrangements for carrying containers in available spaces. The fully cellular container ship is equipped to carry containers in the holds and on the weather deck by means of special structural arrangements and devices. Within the holds of such vessels there is a cellular structure of angle bars forming container guides into which the containers are stowed, one on top of another. The containers carried on deck are carefully secured to ensure
that they not shift. The only movement of container within the ship is vertical and thus loading and discharging is carried out by vertical movement without horizontal movement. Heights of stacks vary and may be six high in the holds. In general, cells are arranged fore and aft in groups, the number depending on the ship’s breadth. The transverse width of the groups may be 80 percent of the breadth of the ship. Consequently, large hatches are essential in order to use the holds to the best advantage. The fore and aft groups between bulkheads are separated by heavy web frames, or similar structure, to act as support to the cells and also give rigidity to the vessel. Each cell circumscribes one container stack and extends from the hatch coaming level to the tank top.

The basic functions of the cell-guide system are two-fold:

a) to facilitate the lowering and positioning of containers

b) to distribute the lateral loads from the containers to the adjacent hull structure.

Tankers have only very small openings in the deck, while bulk carriers have quite large deck openings; but in the case of container ships, with their vertical stowage loading, the hatch ways are very large indeed since accessibility of the hold is of utmost importance. Indeed, the distinguishing features of a container ship are the large hatch openings and the omission of the tween decks. These lead to structural problems in that enough deck width has to be left at each side for longitudinal strength otherwise excessive plate thickness would be necessary.
In general, container ships do not need to have cargo handling gear as they operate only from special terminals which have the equipment for dealing with container traffic.

Although cellular container ships have limited flexibility in the use of space some the constraints these impose are being overcome.

First, containers are tending to increase their penetration of small bulk and semi-bulk flows. This is partly a matter of improvements in technology which are overcoming the problems in handling of agricultural materials and other difficult products and partly of the advantages of high quality liner services and of the scale available to cellular ships. Further to this, cellular ships have found the means to handle some large items and even heavy lift cargoes. These may be carried on the weather deck but in some cases adjustments have even been made to cell guides to provide for additional space.

Within the hull of the ship itself containers and cell guides take up a considerable amount of space. However, there are compensating savings in that there are no decks or crane installations and extensive use may be made of the weather deck. There is also the point that the cellular system makes for better use of the below deck space than can be achieved with squared-off holds.

Finally, a container lo-lo operation provides excellent access to cargo so that ships can be effectively stowed for multi-port operations. There is loss of handling potential when operating on complex itineraries in that the number of cranes which may be employed on a large ship is reduced from four to two, but this can still give up to about 800 moves a day whilst the amount of re-storing required can also be held to an acceptably low level.
3.2 SEMI-CONTAINER SHIP

Semi-container ships represent something of a compromise between on the one hand conventional break-bulk and, on the other, container ships. There are basically two types:

a) those that store containers on deck, using the holds for conventional break-bulk cargoes

b) those that have one, or more holds equipped with cell guides to store containers below deck as well as above.

Conventional ships first began to incorporate a capacity for containers in the late 1960’s. This was achieved by a variety of means:

a) hatches and tank tops were strengthened for containers

b) deck height and hatch size were selected for compatibility with containers

c) lifting gear with greater capacity was fitted.

Semi-container ships were originally designed with a mixture of container and break-bulk stowage in mind. From about the mid-170’s onwards, two further developments arose:

a) maximum size increased to 24000 dwt
b) maximization of container capacity became an explicit design objective.

The competitive trading efficiency of semi-container ships stems from two advantages in particular.

Firstly, they provide flexibility in the use of space and thus have the capability for a wide range of cargoes. Secondly, given their relatively small size, they offer better access to cargo than other ships.

They, therefore, represent quite a sensible selection for transitional routes of moderate length, and for longer routes where spare cargo flows, and geographical dispersion of cargo, tends to limit the size of ships. However, if large sized vessels are required, cargo accessibility acts as a severe handicap to semi-container ship operations. In these circumstances the deep sea ro-ro ships may be preferred. Moreover, as container penetration raises the semi-container ships relatively poor ratio of container capacity, bale capacity becomes increasingly uncompetitive compared with fully cellular operations.

There are a number of factors which suggest that semi-container ships may be limited in size to about 800 TEUs.

First, the difficulty and susceptibility to damage of conventional stowage increases with increasing deck heights. This varies with cargo type, and opinions differ as to the feasible maximum, but the ideal for break-bulk operations is probably between twelve and eighteen feet. The 18 ft lower holds and 12 ft tween decks, plus hatch coamings of medium sized semi-container ships are clearly efficient in both container and break-bulk operations, but the 27 ft lower holds of the larger ships are by no means ideal for break-bulk. Any increase in ship size would
either increase the amount of space in the very deep holds or create a requirement for an expensive second tween deck.

Secondly, the capacity available for break-bulk cargoes would be large in relation to size of flow expected in most routes and problems of cargo accumulation and organization would become rather difficult.

Finally, as stack height increases cell guides become rather more important in container stowage.

All of this suggests that an increase in size needs to be associated with a change in concept, either an increase in the use of weather deck, the provision of some cellular holds, or a switch to ro-ro access for below deck cargo, in which case hatches are replaced by stern access and ramps of lifts, and multi-deck capability becomes a much cheaper proportion.

3.3 PURE ROLL-ON/ROLL-OFF SHIPS

The ro-ro ships are, in general, designed for the carriage of motor cars, commercial motor vehicles including trailers and unitized cargo. The procedure of loading and unloading vehicles by driving them on and off the ship necessitates a close association of the ship and shore facilities.

The success of the ro-ro ship depends largely on the efficiency of the equipment used to get the vehicles from the shore into the ship and then the distribution of the vehicles throughout the cargo space of the ship. The types of the transfer and access area are numerous, each designed to serve a specific purpose such as stern ramp, stern door, internal ramp, hoistable platforms bulkhead doors and side ramp.

The arrangement for loading and unloading must be
such as to ensure a quick turn-round and provide entrance and exit that can be made secure. The actual link between the shore and the ship consists, in general, of a bridge ramp hinged at the shore end and supported at the outer end in such a way that the ramp can be adjusted to suit varying tide levels. The connection between the bridge ramp and the ship is usually by a secondary ramp. The latter may be a door or an internal ramp. The method of loading may be by doors at the stern, bow or side.

Weather tight stern doors are fairly common practice and they also act as ramps connecting the ship to the bridge ramp. These doors are very wide so as to cope with at two lanes of traffic.

As bow doors have to contend with ahead seas they must be as strong as the surrounding fore end. In general, they are side-hinged or of the visor type, hinged to open upwards. Internal watertight doors are also fitted and these are used as bow ramps.

Side doors are in one piece and open outwards. Frequently they are used as side ramp. In order to retain the longitudinal strength, the hull is reinforced in was of the door opening.

A crucial influence in the development of deep sea ro-ro shipping was the boom in the trade with OPEC countries in the 1970’s. Their conventional port systems became overwhelmed, causing acute congestion and very long delays.

In these circumstances road trailer systems, in particular, offered a ready solution. Such ships were self-sustaining, gave fast ship turn-round, as the trailers could by-pass the port transit areas. As a result they were given a greater many preferences. Ro-ro ships thus secured great time savings which more than compensated for their higher construction costs, and
3.4 CONTAINER RO-RO SHIPS

Container ro-ro ships were built for world wide trading and leasing market where the emphasis is on minimizing costs per slot mile.

A particular feature of the design is the very broad beam, which provides stability for a large weather deck capacity. Since the under deck space provides for only a two high container stow in the smaller ships and three in the larger container, cell guides are scarcely required. These are, however, essentially container carrying ships. The self-sustaining cargo handling gear consists of container handling gantries but where wharf access is limited, ro-ro or ro-ro/lo-lo combination systems can be used.

The inexpensive ro-ro access also provides flexibility in the use of hold space, which accounts for something over 30% of the capacity, but it is not capable of sustaining fast cargo operations. A special feature of the container is that where the main deck is being used for ro-ro cargoes of moderate height, a tier of containers may be suspended from the weather deck.

3.5 CONTAINER/BULK CARRIERS

These carriers can be divided into several types.

3.5.1 OPEN HATCHED GEARED BULK CARRIERS

Their primary cargoes consist normally of unitized bulk forest products, the stowage and handling characteristics of which closely resemble those of
containers. These vessels often possess a self-sustaining capability and so are not confined to container berths.

By container ship standards these vessels are usually large, typically between 35000 and 50000 dwt offering a high TEU capacity (1300 TEU). The forest products trades involve long hauls (e.g. West Coast North America-Europe; Far East-Europe). Accommodating containers on an otherwise expensive empty back-haul is a considerable inducement to their development.

3.5.2 ALL PURPOSE BUILT CONTAINER/BULK CARRIERS

These ships are normally designed with a particular route and cargo mix in mind and are found in service with established container/bulk operators.

The vessels' dominant characteristics consist of large dwt size and high TEU capacity with design speed of around 15 knots. Their low bunker costs, coupled with their large size, contribute to their competitive efficiency cellular tonnage. The latest CAST new buildings are of 70000 dwt, 1500 TEU capacity, and draw 13.4 m of water. All purpose built conbulkers are not self-sustaining and are thus tied to specialized container berths. Often being without cell guides, this imposes additional equipment requirements on terminals as fork-lift trucks have to be lowered into the holds to complete the stowing operation. Their port turn-round time tends to be rather slow.

3.5.3 CONVERTIBLE BULK CARRIER

Other ships, convertible for the carriage of containers by equipping some holds with cell guides and strengthened hatch covers for weather deck stowage of
boxes, forms the mainstay of this sector. Additionally, some vessels have been built with container carrying capability made explicit in the design, not from any particular requirement for long term container/bulk trading but rather from the point of view on going ship trading flexibility.

3.6 CONVENTIONAL RO-RO SHIPS

A close relative of the ro-ro container ship is the conventional ro-ro, in which a basic lift-on tween decker divided internally into a number of holds by transverse bulkheads is given a further dimension by the addition of a ro-ro ramp. At its simplest this provides for a quarter ramp to be lad into the tween deck itself, bulkheads being pierced at this level and hatches being flushed over to allow vehicles, such as fork lifts, and rolling cargo to be driven the full length of the ship at this level, passing the machinery space through a wide alleyway.

This arrangement introduces an extra element of flexibility to cargo handling, as it is usually possible to work the tween deck in ro-ro fashion at the same time as the ship's cranes and other gear are working the lower holds.

As it usually judged to be beneficial from a damage point of view to roll wheeled cargo units rather than to lift them (this is certainly the case with cars) a vessel fitted with a ramp can be thought of as having a valuable plus point as compared to a ship not so well equipped. Against this must be set the additional cost of ramp, adequate closing equipment and special arrangements and reinforcement in the tween deck to enable heavy vehicles to be driven over it. This can amount to a substantial sum especially when such equipment has been fitted to
large cargo ships, where it was inevitably combined with other sophisticated equipment design to make the vessel truly multi-purpose. In its most extreme there have been designs of multi-purpose ships that have been very expensive. In addition, there is often a price that has to be paid in terms of less deadweight that can be carried where a large amount of cargo handling equipment is carried.

A conventional ro-ro ship having a maximum deadweight of nearly 20000 tonnes, 4 cranes and 4 holds can carry 307 TEU onto the weather deck in addition to 332 TEU in the holds.

3.7 PASSENGER/ CAR FERRY

These ships can carry passengers, cars as well as container trucks at a short distance. Cars and containers with trucks are introduced from the ramp way at the bow or stern.

Generally, there are many types of ships, but only one of them can carry containers depending on the design of the ship.
4.1 CONTAINER TERMINAL

Minimum requirements for container terminals have to be established at several levels: area requirements, soil conditions and storage, terminal transport needs and interface installations. The main decision with regard to investment requirements is whether to build a specialized terminal or to make a choice for some other intermediate solutions better suited to the country's specific circumstances.

There are a number of such intermediate solutions, depending on the port's needs as well as on the existing facilities. Consequently, the decision should be based on each individual case.

The total area required for a container terminal is largely determined by container storage needs, to which should be added requirements for transfer operations and auxiliary services (often an area as large as the container storage yard). The size of the storage area is determined mainly by four factors:

a) number of TEUs to be handled (it must be noted that it is not the actual number of containers but the translation into TEUs that is of major importance)

b) type of container handling equipment used, as this determines stacking height and access
requirements, typical area requirements per TEU as a function of the handling equipment used are:

<table>
<thead>
<tr>
<th>Stacking height (number of containers)</th>
<th>Square metres per TEU</th>
</tr>
</thead>
<tbody>
<tr>
<td>Chassis system</td>
<td>65</td>
</tr>
<tr>
<td>Straddle-carrier system</td>
<td>30</td>
</tr>
<tr>
<td></td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td>Gantry-crane system</td>
<td>15</td>
</tr>
<tr>
<td></td>
<td>10</td>
</tr>
<tr>
<td></td>
<td>7.5</td>
</tr>
</tbody>
</table>

c) average dwell time of containers, since area requirements vary in proportion to the length of time containers remain in the depot.

d) time distribution of containers to be handled, i.e. steadiness of container flows and resulting differences in average and peak container flows.

Where land is cheap and abundant, planners are relatively free to decide on the type of handling equipment used on the basis of the operational and economic merits of each option. Other the other hand, if land is expensive and scarce, a high stacking system might have to be adopted. Furthermore, soil conditions represent a restrictive factor in the choice of a handling system. With high stacking systems, both the containers and the stacking equipment place a heavy strain on the ground under the terminal. This is of particular importance if the terminal is built on the reclaimed land with soft soil that requires expensive reinforcement. In such cases, the one-high method may be particularly
4.1.1 HANDLING SYSTEM

Different handling systems are reflected in the layouts of the different terminals using them. It can not generally be concluded any one of these systems is better than the other, each has to be judged in the light of its own merits and local circumstances. Furthermore, the systems are not necessarily applied in their pure forms, very often mixed systems are used. In such mixed systems the most suitable equipment can be used for each particular operation. Mixed systems might become a necessity in cases where lo-lo and ro-ro container operations are carried out at the same terminal.

4.1.1.1 TRAILER STORAGE SYSTEM (CHASSIS SYSTEM)

In the trailer storage system, containers are discharged from the ship by crane, directly placed on the road trailers and subsequently towed to an assigned position where they are stored until they are picked up by a road tractor.

For export containers, the same procedure is done but in the reverse order.

The advantages of the system are: high flexibility, speed of terminal transport, random access to containers, low ground pressures consequently low requirements of soil conditions. On the other hand, there are severe constraints on the use of system, so its application tend to be limited to terminals operated by shipping companies. These constraints are the large space requirements and,
most important, the considerable expense entailed by the large number of trailers required. Moreover, since the trailers will move outside the port area, they will have to be provided by the shipping company.

4.1.1.2 STRADDLLE—CARRIER SYSTEM

The most commonly used handling system is the straddle—carrier system, either in a pure form or combined with tractor-trailer units to perform the transfers between the quay side and storage areas.

Straddle carriers have a theoretical capacity of stacking containers three (in some cases even four) high, although in practice this capacity will not be attained, it would require a perfect flow of information to guarantee permanent access to containers.

The main advantages of the straddle—carrier system are: good space utilization, high flexibility, ability to meet peak requirements, relatively low expenses for storage area pavements owing to the weight distribution over eight wheels and compensating suspension systems.

In the past, some ports suffered from the poor performance of the equipment. This, however, has been largely overcome by improving equipment design and reducing the excessive use of straddle—carriers for transfer operations between quay and storage areas by the use of a combined system.

4.1.1.3 GANTRY—CRANE SYSTEM

The gantry—crane system is based either on rubber—tired or on rail—mounted gantries, the basic differences being, first, that rubber—tired gantries can serve different areas of the terminal while the rail—mounted
ones are tied to the location of the rails, and secondly, that the rail-mounted ones are able to serve wider area under the portal than the rubber-tired ones.

Transfers between quay side and storage area are normally made by tractor-trailer units.

The advantages of the system are: good area utilization by high stacking, high reliability, suitability for automation and low maintenance requirements.

The system, however, is less flexible than the straddle-carrier system and is often difficult to operate in developing countries, where import containers constitute the major proportion of the traffic.

4.1.1.4 FORK-LIFT TRUCK SYSTEM

The fork-lift truck system is used at terminals with a relatively low throughput. Fork-lifts are comparatively inexpensive, easy to maintain and highly flexible. The latter aspect is of particular importance as the equipment can be used not only for container operations but also for ro-ro operations or for the handling of conventional cargo, which makes the system especially suitable during transitional periods when volumes are less than 50000 units per year.

For pure container operations, however, a number of drawbacks have to be taken into consideration: productivity is lower than in the case of straddle carriers, area requirements are relatively high owing to the need to provide sufficient maneuvering space, heavy pavement is required to withstand front axle loads of loaded fork-lift trucks.
4.1.2 QUAY SIDE REQUIREMENTS

With regard to quay side requirements, a differentiation must be made between sea-side and land-side requirements.

The ports of many developing countries suffer from draught limitations in approaches, turning basins and berths. Dredging operations may therefore have to be performed to allow container ships of anticipated size to enter the port.

Typical depth requirements for container ships of different generations:

First generation vessel ............. 10.5 m
Second generation vessel .......... 12 m
Third generation vessel .......... 13.5 m

Dredging can be costly and constitutes an important item in terminal cost calculations, the level of which has to be established case by case. There may be cases, however, where dredging has to be performed irrespective of cost, if alternative sites for a terminal are not available.

The basic sea-side requirements for a terminal are that ships should be able to enter a port safely and to be worked in all weather conditions. Owing to the high cost of vessels' time, it is indispensable that sufficient attention be paid to these requirements to avoid delays or damage to vessels and also to depth of water, construction of break-waters, provision of fenders and construction of quay walls.

To minimize loss of time by ships in estuaries or rivers and to avoid dredging to the greatest extend possible, a terminal location close to the open sea is often chosen. This may require the construction of break-waters to ensure that the vessel can be worked in
all weather conditions. Before constructing a breakwater, careful analysis of meteorological data and monitoring of wave patterns are necessary to design and build the breakwater most suitable for local conditions.

The quay wall for deep-water berths usually consists of a steel sheet pile wall. For a water depth of 12 m (second generation container ship), steel sheet piles of about 30 m have to be driven into the sea bed to form the quay wall.

Fender system are of critical importance in the design of deep-sea container or ro-ro terminals. Inadequate fending can result in extensive damage to the ships as well as to the quay wall. The cost of an adequate fender system may be estimated at about 200000 to 250000 US$ per berth.

4.1.3 BERTH REQUIREMENTS

The decision on the number of berths to be constructed is the most critical one because it will in turn influence the investment of the terminal. For each berth there will be surfacing and equipment requirements, so that the number of berths determines the total cost of the terminal.

Berth requirements for a container terminal are considerably lower than the conventional facilities handling the same amount of cargo, owing to increased ship size combined with large size of consignments per vessel and more rapid handling rates. Berth occupancy rates will be kept lower than the break-bulk berths to avoid excessive waiting time, as container vessels are very capital intensive and require fast turn-round.

Avoiding waiting time for vessels is one of the main criteria in the investment decision for container berths.
It would be unreasonable, however, to expect ports to provide sufficient berths to guarantee berthing possibilities at all times, including exceptional peaks. On the other hand, it would be just as unreasonable to base the calculation on average requirements, as this would lead to frequent delays and ultimately cause shipowners to bypass the port. To avoid such developments, simulation programmes should be employed in the planning stage to take into account cyclical traffic variations and to determine the desirable balance between increasing investment and reducing ships' waiting time at peak periods. Some planners avoid this step by working on the basis of pre-established average berth occupancy rates. While this approach might be feasible in the case of terminal extensions where data on past experience can be used, it is doubtful whether average occupancy rates can in general serve as a useful tool for determining berth requirements for a new terminal.

The negative effect of wide fluctuation in berth utilization can be somewhat reduced by establishing schedule-day agreements with vessel operations. However, it is to be recognized that, even if such agreements can be reached, the risk remains that vessels, especially on the deep sea routes, will be delayed, thus rendering the agreement ineffective. Such risks can be countered only by building large safety margins into the agreements, and this again reduces the effectiveness of the system.

4.2 INLAND TRANSPORT: MODES

4.2.1 RAIL TRANSPORT

The introduction of containers allows railways to take greater advantages of the strong points of the rail system.
and to eliminate or at least reduce the impact of its shortcomings. The introduction of multi-modal transport gives rise to a modal split, leaving the trunk haul to the railways and further distribution to road transport operators. This concept may prove especially feasible in the case of containers from or to sea ports, as the concentration of containers at the sea port terminal may permit the establishment of unit trains, thus partly relieving the railways of the costly and time-consuming shunting and marshalling operations which are an inherent feature of traditional wagon-loading transport. If such terminal-to-terminal services can be realized, the container partly takes over the transport functions of a conventional wagon.

In view of the rising cost of petroleum products the problem of optimum use of trucks has become a vital one, especially for developing countries.

In the DPR of Korea the railway transport is a more optimum means than road and inland waterway transport, as it does not produce petroleum but there are many electric resources such as water power.

However, most railways have single tracks so eventually cargo congestions take place often in the railway transport.

In order to overcome this problem a double railway should be constructed from Nampo to Chonzin via Pyongyang, Wonsan, Hamhung (approximately 2500 km). Before the double track construction the efforts to enhance the ability of transport by single railway tracks should be given by introduction of an automatic operation system, expansion of the railway stations and the carrying capacity of the trains.

On the other hand, inland waterway transport and road transport should also be developed in conjunction with
rail transport.

4.2.2 ROAD TRANSPORT

Compared with other modes of inland transport, road transport on a large scale is of rather recent origin. Nevertheless, road haulage has assumed considerable importance and now constitutes in most countries the backbone of transport systems for carriage of high valued general cargoes.

Road transport has also played a very decisive role in the development of many countries, owing to its ability to create networks more easily than other modes of transport and consequently to promote balanced regional development.

The relationship between road and other modes of inland transport, especially rail transport, can be both substitutional and complementary, meaning that on trunk hauls the different modes might compare with each other, while road transport will usually complement other modes by taking over the tasks of final distribution or collection of cargo of consignees/consignors not directly connected to rail or inland waterway transport.

Because the land is mountainous and very indented, the conditions between ports to hinterland are not enough to carry heavy and long containers in the DPR of Korea.

However, the western area which Nampo Port is located, is comparatively flat so that the road container transport is available from the Nampo Port to Taean and Pyongyang.

In the case of Chongzin Port the situation is different as this area is highly mountainous and indented. Therefore, a double railway should be constructed.
4.2.3 INLAND WATERWAY TRANSPORT

For the carriage of containers on inland waterway vessels, it is essential that a way be found in order to benefit from the strong points of this system, i.e. transport of large volumes of cargoes at low cost.

In the case of the DPR of Korea, there are not many rivers and lakes which can be used for cargo transport. The Taedong and Apnock rivers area available. After the West Sea barrage was built the depth of the Daedong River was higher than 5 metres so that waterway transport from Nampo Port to Daean, Pyongyang Sunchon is now available. However, at present the waterway cannot be used in the winter time (approximately 4 to 5 months in a year). Nevertheless, this waterway transport will reduce cargo congestions.
CHAPTER V

CARGOES AND CONTAINER FEEDBACK

5.1 CARGOES

The DPR of Korea's international trade was similar to that of most of the developing countries in the past decades. Manufactured goods were imported, but raw materials and semi-manufactured goods, most of which were not suitable for containers, were exported. As a result of this, a lot of empty containers were shipped on board to be sent back.

Thanks to the economic development and the Government Policy of self-reliance, the dependence on import of manufactured goods and export of raw materials was largely reduced and overcome. For instance, instead of iron-ore which has been one of the major export in the past years, rolled steel, steel pipes and other semi-finished and finished products such as tractors, machine tools are now exported.

However, still a very large quantity of raw-materials and not suitable for containers, such as cement, coal, magnesia clinker are exported.

In order to overcome the imbalance of container transport, the government at present gives great importance to the production of goods manufactured in the DPR of Korea and by using our raw materials, instead of importing from abroad.

The main export cargoes in the DPR of Korea are as follows:

a) Containerizable cargo
- machine tools
- textiles
- fertilizers
- cigarettes and tobacco
- solder
- zinc
- consumer goods
- fruits

b) Non-containerizable cargo
- tractors and trucks
- rolled steel
- iron pipes
- cement
- coal
- magnesia clinker
- fish

The main import cargoes in the DPR of Korea are as follows:

a) Containerizable cargo
- precision machinery
- fertilizers
- chemical goods
- rubber
- tropical fruits

b) Non-containerizable cargo
- petroleum
- large equipment
- sugar
- cars
5.2 FEED BACK OF CONTAINERS

The imbalance of containerizable cargoes by sea transport is much larger than by railway transport.

After the liberation of the DPR from the Japanese and the 'Korean War' the foreign trade of the DPR of Korea was largely dependent on trade with China, the USSR and Eastern European Socialist countries.

From the 1970's many imported cargoes were carried in the form of containers by rail. Because there were no cargoes to be transported by containers in the DPR of Korea at that time, empty containers were sent back.

However, according to the national economic development, the quantity of empty containers to send back were reduced step by step.

According to the expansion of its foreign trade with more than 100 countries by sea transport, the container imbalance was also taking place in the sea transport.

From my point of view, the reasons are the following:

a) The imbalance of trade of containerizable products

b) Disconnection with hinterland

c) Lack of container ships

d) Lack of container terminals, equipment and facilities

The imbalance in trade of containerizable goods has created yet another problem for the port authority. There is a number of empty containers as compared with full containers leaving the port.
The container park at Nampo Port is stacked with many empty containers, that have not been collected by various lines and have remained in the port for several months from time to time for years. These uncollected empty containers have also created problems because they are occupying valuable slots which could be utilized for other cargoes to be transported.

The management has not taken a clear and strict decision on this situation but I consider that the delay in taking decision is based on the fact that the arrival dates of most of these containers cannot be ascertained. And no action to overcome this difficulty is taken in the near future, such as, selling these containers or adopting a policy clearly starting definite period as to how long empty containers would be allowed to remain in the port and how the empty containers should be disposed of by the appropriate authority, the storage bills of the units will exceed the value of containers.

In the case of the DPR of Korea, containers that come from abroad are usually sent back to the owners in a stipulated period of days and the cost for the use of the containers paid for. However, many containers are not sent back in time so eventually we have to pay demurrage. In my opinion, this situation will not be overcome as long as the overall requirements needed to establish containerization are fully met.
CHAPTER VI

MANAGEMENT

The principal objective of this chapter is to present the author's personal point of view with regard to the management.

6.1 ORGANIZATION OF THE CENTRAL ADMINISTRATIVE STRUCTURE OF THE CONTAINER SYSTEM

The success of any activity and the container system depends completely on its organization and management strategy.

When contemplating the establishment of a container system one may question whether it is possible to create a new organization or simply to incorporate the container activities in an existing company or government organ.

The addition of container activities to an existing shipping company has both advantages and disadvantages. One of the advantages is that the administration needed for container operations can be included in the following departments: the legal department, the administrative department, the financial department, and the operations department. There is no need to establish a separate administrative department to deal with container activities. The only additional personnel required would be technical specialists.

On the other hand, this shipping company when expanding its services to include a container system will be taking responsibility for related activities which normally do not fall within the scope of the shipping company. These include inland transport, container control, container repair, container purchasing and
In my opinion the inclusion of the above mentioned activities can lead to the weakening of the company's principal function, which is to operate and make optimal, profitable use of ships.

The container system can be used in different ways, such as door to door, door to port, port to port, port to door or feeder but it is important to remember that the container is the common denomination in the development of inter-modal transport and this mode of transport can only be considered truly intermodal if there is only one transport operator who oversees and is responsible for the entire series of transport links. Therefore, it is my opinion that the container activities should not fail under the umbrella of an existing company, but rather be operated as a separate entity.

With this in mind, I propose to present a model of an administrative organization of a container system in a developing country is in Fig 6.1

It's functions and responsibilities are as follows:

a) President:
   The executive officer directs the policies of the company activities. In some cases the president may be aided by an assistant, however, this position may not be necessary if the dimensions of container traffic are small.

b) Commercial Vice President:
   The Commercial Vice President is responsible for directing and coordinating the activities of the Marketing Department, the Cargo Procurement Department, and the Pricing Department. These three departments work together to analyse the
market, obtain cargo and rates set freight rates. More specifically these departments have the following functions and responsibilities:

The Department of Marketing is responsible for an ongoing analysis of market conditions, for appraising the present situation as well as forecasting the future outlook, so that company policy can be formulated. This department is also in charge of purchasing, sales and leasing of containers.

The Cargo Procurement Department deals with the acquisition of new sources of cargo for both import and export. If the demand for containerized cargo transport is sufficient, this department proposes the opening of container bases.

The Pricing Department is responsible for the setting of freight rates and drafting of contracts with all parties related to the container service.

c) Operations Vice President

The Operations Vice President directs the work of four departments namely, the Chartering, the Container Control, the Transport Operations and the Container Base Operations.

The Chartering Department is responsible for the chartering of ships in order to carry out company services.

The Container Control Department oversees the container control, paying particular attention to the precision and efficiency of container movement, so that any delay or damage can be tracked and liability claims be filed accurately.

The Department of Transport Operations ensures the smooth operation and coordination of all of the various
means of transport which are chartered with the objective of offering door-to-door, door-to-port, port-port, port-to-door service.

The Container Base Operations Department is responsible for the control and operations of the container bases.

d) Financial Vice President

The Vice President of Finance is in charge of overseeing all company's financial matters and takes an active part in the analysis and the execution of development programs and investments of the company. He directs two departments, namely, the accounting and the invoicing and payment control departments.

The accounting department is responsible for bookkeeping and maintaining a continual check of the state of accounts and of the profitability of the company.

The invoicing and payment control department keeps periodical financial analyses, maintaining control of departmental balance sheets, invoices, recovery and payments.

e) Administrative Vice President

The Vice President of Administration is responsible for all personnel matters. He directs three departments, namely, the internal services, the investment development, and the personnel and training departments.

The personnel and training department supervises technicians and workers, and develops and administers training courses to upgrade the skills of the personnel.

Finally, the internal service department is in charge of company transport and communications, for the
acquisition and distribution of material resources necessary to execute the work of the company, and the maintenance of the installations.

e) The legal department
This department, as the name implies, is responsible for all legal and judicial aspects of the company, namely preparing legal documents, leases, shipping documents etc, and discussing cases in national and international arbitration cases. This department is also responsible for the analysis and identification of the way in which national and international regulations, laws related to the company activities are implemented. The department elaborates, approves, and prepares certain legal and official documents which need to be published, for example, tariffs, regulations, disposition, and information.

f) Domestic and Oversees agencies
A container company should have domestic and oversees offices in certain areas and foreign countries to provide close, regional container control, to organize the receiving and sending of containerized cargo, to make contracts, to manage transport, personnel and services and to execute all negotiations related to company activities.

6.2 THE ORGANIZATION OF A CONTAINER TERMINAL AND ITS FUNCTIONS AND RESPONSIBILITIES

A container terminal is made up of the berth(s) where ships can make their loading and/or unloading operations; the space or area where containers are stacked, and of a
repair workshop where the cargo handling equipment is repaired. Clearly the success and efficiency of container operations will depend upon the administrative structure of a container terminal. See Fig 6.2.

In my opinion, the administration of a container terminal should be divided into the following departments: the Operations Department, the Technical Matters Department, the Department of Container Control, the Department of Personnel, and the Department of Finance, all of which would come under the leadership of the terminal's administrator.

Port customs would form another port activity area, but not fall under the responsibility or direction of the terminal administrator as it is a government organ.

a) The Department of Operations
The work of this department is generally to carry out the daily, weekly, monthly and annual plans for operations; specifically this department develops terminal work shift schedules, and in conjunction with this, the distribution of workers in each area of activity, for example, teams of stevedores, teams drivers and operators of cargo handling equipments. They also determine the type and the quantity of each piece of equipment needed to carry out each of the various terminal operations.

b) The Department of Container Control
This department is responsible for the control and checking of all documentation related to the containers bound for export and containers received as imports. Another function is the organization and planning of the stacking
important function is the organization and planning of the stacking in each of the terminal areas, for the careful and detailed check of documentation and the stacking of the containers stuffed with dangerous goods to ensure that both nationally and internationally established regulations concerning containerized cargo are fulfilled. For this they must bear in mind the International Maritime Dangerous Goods code.

c) The Department of Personnel
This department is responsible for all work sites, and ensure that the personnel of each meet the technical and professional qualifications, experience and personnel characteristics required. This department is further responsible for raising the technical level of the workers by means of general and specialized training.

d) The Department of Finance
All financial matters are handled by the finance department, their work includes preparing invoices, accounting costs and collecting and recording balance sheets of each of the terminal department.

The department is further responsible for invoicing all services provided by the terminal and the analysis of the tariffs which apply.

This department is very important because it can determine the financial status through analysing the profitability and productivity of the terminal and the degree of financial flexibility with which it is possible to operate.
f) The Port Customs

One of the essential activity in a container terminal takes place in the port customs office. It is here that national laws and regulations related to the import and export of merchandise are safeguarded.

The office works very closely with the administration of the container terminal, but it does not come under the management because it is a government body. As such it can act as an official representative of the government in legal and judicial matters.

The container terminal may be under the general port authority as its activities are an integral part of port operations.

6.3 CHARACTERISTICS OF MANAGEMENT PERSONNEL AND TRAINING

It is very important not to have only an organization which is well structured, but also one in which managers at every level are well prepared for the responsibility needed to carry out their activities.

As it is so important, I would like to mention some elements which must be kept in mind at the time of selecting the management leaders of each activity area.

What must be considered when recruiting a person for a leadership role in the container organization? Certainly a manager should possess the appropriate technical or professional qualifications and experience in the area in question. He or she should also demonstrate dependability in exercising responsibilities, and have some essential personal characteristics and abilities.

I will mention some of the most important personal and professional characteristics of a leader:

a) They include efficiency, boldness, honesty, self-confidence, sense of humor, sense of justice,
A good manager also shows initiative and perseverance when it comes to plans or projects, integrity and tact are also essential.

He/she should be skillful in preparing and clarifying department aims and further breaking these into smaller workable objectives.

He/she should always tell the group not only what they should do, but also why they should do so.

Encouraging or building team spirit is another valuable skill a manager should possess.

It is probable that there are a few people who have all of these attributes, but it is necessary to bear in mind that the majority of these can be learned and developed with practice. Therefore, wise directors assess their workers with the long-range objective of shaping new directors, and promoting those with managerial potential to administrative and managerial positions so that they can expand their background and obtain the basic knowledge about many areas of the company.

Once in a managerial position, it is essential that a person keep in touch with developments in the container field especially in the DPR of Korea, through which:

They should read professional journals which are published internally and internationally.

It is very useful them that they attend local, national or international meetings, workshops,
seminars, conferences, etc, regarding the management of a container system

c) The Maritime Training Institution which exists in the DPR of Korea for high level personnel of maritime matters, should include container transport operations and management in its training program. So far it has been partly (very small) dealt with as an international trend which is available mostly in developed countries.

d) At every maritime training institution such as Lazin Maritime Institute, Nampo Maritime Institute, etc, there should be a professional subject of containerization in the DPR of Korea.
CHAPTER VII

RECOMMENDATIONS AND CONCLUSIONS

In this paper I have tried to give some ideas about general and essential requirements for the containerization in developing countries, such as the DPR of Korea which has not established a container system.

We are all aware that most developing countries are facing great problems in the establishment of containerization because of a lack of finance, administrative organization, imbalance of container flow, imbalance of containerizable cargo to be imported and exported, and lack of skilled personnel needed, etc.

In order to develop and improve containerization in any developing country, a key element must be given to the capability of the people who are responsible for containerization. It is really the most important priority. These countries need to prepare specialists, technical experts, leaders, people capable of representing their countries in international meetings, conferences, etc.

It is highly unlikely that developed countries are going to stop their penetration in the transport trade of developing countries. Therefore, the developing countries must wake up and ensure that they obtain a greater percentage of their national trade by taking steps to expand their transport services. The establishment of a container system is absolutely vital for the achievement of this goal.
7.1 ADVANTAGES AND DISADVANTAGES

7.1.1 ADVANTAGES OF CONTAINERIZATION

a) It permits a door-to-door service being given which may be from the production site to the distributors shop

b) No intermediate handling at the port is needed

c) The absence of intermediate handling plus quicker transit permits less risk of cargo damage and pilferage

d) Low risk of cargo damage and pilferage enable more favorable cargo premiums to be obtained compared with conventional cargo shipment

e) Elimination of intermediate handling at terminal transfer points, i.e., ports enable substantial labor savings to be realized, which in industrial high income per head countries can realize considerable attractive financial savings

7.1.2 DISADVANTAGES OF CONTAINERIZATION

a) Containerization is a capital intensive project and as such is beyond the financial ability of many shipowners. In many cases container services are now operated by members of the old conference groupings establishing a new consortium. Even so, the financing required is very great. Not only specialized ships are to be built but also at least three sets of containers, with
regard to the latter, ownership has tended to be held by container hire operators and by industrial companies (who use containers not only to carry but to advertise their goods), and by shipping consortia. In all three sectors, however, there has been good deal of leasing of containers with the operational control testing with the lessors.

The expense does not end here for at the chosen terminals the authority has to bear the cost of providing specialized cranes, trailers, van carriers etc., as well as strengthening quays and creating stacking space.

b) Not all merchandise can be conveniently containerized. The percentage of such traffic fall annually as new types of containers are introduced. Nevertheless, it is a constraining factor and can involve the shipper in capital outlay to adopt his production process/premises/packing etc, to suit the restrictive dimensions/weights imposed by the container.

c) The container in itself is a high capacity carrying unit, and as a consequence exporters with limited trade are unable to fill the container to capacity, and thereby take full advantage of an economical through-rate for example, from exporters’ factory premises to importer’ warehouses. This situation has been largely overcome by the provision of container bases situated in industrial areas or port environs, where less than container load traffic (LCL) is stowed into a container with other compatible traffic of similar destination/area.

d) There can be a significant time lag between the introduction of the first specialized vessel and the implementation of a full container service. Many problems
have to be overcome from the adoption or replacement of existing port facilities to the training of dock labor in the new skills needed. Such a change over could require the continued use of conventional ships during the interim period in order to prevent the building up of the back log which could possibly embarrass the new service. Mention should be made here of the great work of cooperation between shippers, shipowners and port authorities during the establishment of container services to Australia. There is no doubt that the lessons learned there will help in the avoidance of problems when other services are set up.

e) In some trades a very very small percentage of the traffic is incapable of being containerized due to its nature such as certain livestock. This does involve the shipowner in providing specialized-non-container facilities on the vessel which inflates the special cost of the project, and sometimes results into poor utilization of such facilities on the return passage.

f) The stratification of some trades varies considerably by time of year and direction, for example, a trade may have a preponderance of perishable cargo in one direction eight months of the year, whilst in the reverse direction the cargo may be consumer goods.

7.2 POSSIBILITIES AND RECOMMENDATIONS

Now the Government of DPR of Korea gives great importance to the expansion of transport capability in accordance with the development of the national economy and the expansion of foreign trade.
7.2.1 TRAINING

In order to establish a container system in developing countries, including the DPR of Korea, it is essential to train the people who are responsible for container transport system. In accordance with the development of the container system in the world, the contents of the education for containerization at maritime universities and other maritime training institutions should increase. The United Nations Development Program (UNDP) should train the people who are responsible for the operation of the container system. To this end, it is very useful to send students to WMU.

7.2.2 CONTAINER BALANCE

The most difficult problem for containerization in developing countries is to balance the quantity of importing and exporting containerizable cargoes. If the quantity is not balanced it is difficult, even impossible to establish containerization.

Nowadays, in the DPR of Korea, the quantity of importing and exporting containerizable cargoes is not balanced. Whereas they export raw materials and semi-finished products, such as coal, cement, magnesia clinker, rolled steel, iron pipes, fish, machine tools, textile, solder, etc. They import sugar, rubber, cars, machinery etc. It is possible to balance the quantity of containerizable goods.

In order to balance the quantity of exporting and importing containerizable cargoes finished products should be increased instead of raw materials and semi-finished products. Until the early 1980's iron-ore was exported but now at least semi-finished products are exported and
further finished products such as machine tools, factory equipments, etc. will be exported.

7.2.3 CONTAINER SHIPS AND CONTAINERS

In fact without production of container ships and containers it is impossible to establish containerization in the DPR of Korea, because if shippers hire foreign containers and container ships they have to pay in foreign currency but if they hire national container hips and containers they may pay in national currency.

It is possible to produce container ships and containers in the DPR of Korea.

Up to 50000 tons general cargo ships are constructed and more flexible general cargo ships and container ships are planned to be built. Also containers can be there (in the DPR of Korea).

7.2.4 INLAND CONTAINER TRANSPORT

One of the main purposes of of the construction of the West Sea barrage is to connect Nampo Port to the hinterland. Inland waterway transport goods from Nampo Port to Tean, Pyongyang should be expanded up to the industrial area of Sunchon.

However, in the case of the container terminal at Chongzin, it is very difficult to connect the port to the hinterland, because this area is very mountainous. In this area inland waterway transport is impossible therefore the road or rail should be expanded and a double railway be constructed. Now the Government of the DPR of Korea is planning to expand the road and construct a double railway in this area for container transport, as well as national transport. Until it is constructed
containers should be emptied in the port area and carried by rail or trucks.

In general, there are still many problems to be overcome as for example the establishment of the container transport system in the DPR of Korea. However, all the problems cannot be solved in one go and at once. Exports should be given to the establishment of the containerization step by step considering all the facts affecting container transport.
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Annex: 3 Bulk - Container Ship.
Annex 4 Pure Ro/Ro Ship.
Annex: 5  Container Ro / Ro.
Annex: 6
Conventional Ro/Ro Ship.
ANNEX 7 - Containerized Traffic Growth in Developing Countries.

We would like to include in this report some of important statistics about the growth of the container traffic from 1970 to 1982 and the Container Traffic growth prospects to 1990 in the Third World Countries.

Latin American Containerised Traffic Growth 1970/1982

('000 tonnes)

<table>
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<tr>
<th></th>
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<tbody>
<tr>
<td>SOUTH AMERICA</td>
<td></td>
<td></td>
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<tr>
<td>Traffic</td>
<td>144</td>
<td>600</td>
<td>1522</td>
<td>4907</td>
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<tr>
<td>%</td>
<td>17</td>
<td>23</td>
<td>27</td>
<td>47</td>
</tr>
<tr>
<td>C. AMERICA &amp; CARIBBEAN</td>
<td></td>
<td></td>
<td></td>
<td></td>
</tr>
<tr>
<td>Traffic</td>
<td>725</td>
<td>1961</td>
<td>4050</td>
<td>5456</td>
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<tr>
<td>%</td>
<td>83</td>
<td>77</td>
<td>73</td>
<td>53</td>
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</table>

Source: CSR Consultants Ltd.

South and E. Asian Containerised Traffic Growth 1970/1982

('000 tonnes)

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<tr>
<td>SOUTH AND SOUTH EAST AREA</td>
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<td></td>
</tr>
<tr>
<td>Traffic % of Area Traffic</td>
<td>34</td>
<td>1527</td>
<td>7071</td>
<td>17366</td>
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<tr>
<td>% Traffic</td>
<td>18</td>
<td>25</td>
<td>39</td>
<td>46</td>
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<tr>
<td>EAST ASIA</td>
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<tr>
<td>Traffic % of Area Traffic</td>
<td>151</td>
<td>4527</td>
<td>11164</td>
<td>20117</td>
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<tr>
<td>% Traffic</td>
<td>82</td>
<td>75</td>
<td>61</td>
<td>54</td>
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Source: CSR Consultants Ltd.
World seaborne containerized traffic growth
1970 / 1982 (million tonnes)

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<th>Year</th>
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<tr>
<td>1970</td>
<td>47.3</td>
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<tr>
<td>1971</td>
<td>58.9</td>
<td>124</td>
</tr>
<tr>
<td>1972</td>
<td>77.0</td>
<td>163</td>
</tr>
<tr>
<td>1973</td>
<td>106.2</td>
<td>229</td>
</tr>
<tr>
<td>1974</td>
<td>123.7</td>
<td>262</td>
</tr>
<tr>
<td>1975</td>
<td>127.3</td>
<td>269</td>
</tr>
<tr>
<td>1976</td>
<td>158.1</td>
<td>334</td>
</tr>
<tr>
<td>1977</td>
<td>182.3</td>
<td>385</td>
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<td>1978</td>
<td>214.7</td>
<td>454</td>
</tr>
<tr>
<td>1979</td>
<td>235.1</td>
<td>497</td>
</tr>
<tr>
<td>1980</td>
<td>255.5</td>
<td>540</td>
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<tr>
<td>1981</td>
<td>275.3</td>
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<tr>
<td>1982</td>
<td>286.8</td>
<td>606</td>
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Source: CSR Consultants Ltd.
Annex: 9

TEU/CAPACITY OF CONTAINER CARRYING SHIPS OVER 250 TEU. ('000 TEUs)

Ships in Service and on order - September 1978.

<table>
<thead>
<tr>
<th></th>
<th>500TEUs &amp; over</th>
<th>250/500 TEUs</th>
<th>Total</th>
<th>Total %</th>
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<tr>
<td>Fully Cellular</td>
<td>625</td>
<td>47</td>
<td>672</td>
<td>59</td>
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<tr>
<td>Container ro-ro</td>
<td>53</td>
<td>6</td>
<td>59</td>
<td>5</td>
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<tr>
<td>Ro/ro</td>
<td>88</td>
<td>36</td>
<td>124</td>
<td>11</td>
</tr>
<tr>
<td>Semi-Container</td>
<td>85</td>
<td>131</td>
<td>216</td>
<td>20</td>
</tr>
<tr>
<td>Bulk/Container</td>
<td>50</td>
<td>-</td>
<td>50</td>
<td>4</td>
</tr>
<tr>
<td></td>
<td>901</td>
<td>220</td>
<td>1,121</td>
<td>100</td>
</tr>
</tbody>
</table>
Figure: I

20' x 8' x 8'

INSULATED (PLENUM) CONTAINER.

Internal Dimension:
Length 5.66 m
Width 2.23 m
Height 2.10 m

Dooropening Dimensions:
Width 2.23 m
Height 2.10 m

Weight:
Maximum gross 20.320 kgs
Net 17.670 kgs
Tare 2.650 kgs

Cubic 26.4 m³
Figure: 2

20' x 8' x 8'

DRY CARGO CONTAINER.

Internal Dimensions:
Length 5.92 m
Width 2.34 m
Height 2.27 m

Dooropening:
With 2.33 m
Height 2.17 m

Weight:
Maximum gross 20,320 kgs
Net 18,320 kgs
Tare 2,000 kgs

Cubic 31.5 m³
VENTILATED BULK/DRY CARGO CONTAINER.

Internal Dimensions:
Length: 5.93 m
Width: 2.33 m
Height: 2.35 m

Dooropening Dimensions:
Width: 2.33 m
Height: 2.30 m

Weight:
Maximum gross: 20.320 kgs
Net: 18.120 kgs
Tare: 2.200 kgs

Cubic: 32.5 m³
Figure: 4

20' x 8' x 8'

TANK CONTAINER

Weight:
Maximum
Net
Tare

Cubic

20.320 kgs
17.145 kgs
3.175 kgs

8.85 m³
OPEN TOP CONTAINER.

Internal Dimensions:
- Length between frontwall and doors: 5.89 m
- Top endbars and doors: 5.26 m
- Width between sidewalls: 2.33 m
- Upper siderails: 2.11 m
- Height under roof: 2.38 m

Dooropening Dimensions:
- Width: 2.33 m
- Height: 2.28 m
- Width in way or door endbar: 1.85 m

Weight:
- Maximum gross: 20.320 kgs
- Net: 18.270 kgs
- Tare: 2.050 kgs

Cubic: 32.8 m³
FLAT RACK.

International Dimensions:
Length between endwalls 5.95 m
Top endbars 5.95 m
Cornerposts 5.70 m
Width 2.24 m
Height 2.29 m

Weight:
Maximum 20.320 kgs
Net 18.070 kgs
Tare 2.250 kgs

Cubic 30.4 m$^3$
Fig: 6-1 Administrative Organization of a Container System.
Fig: 6-2.

Administrative Organization of a Container Terminal.