UNCTAD MONOGRAPHS ON PORT MANAGEMENT

A series of monographs prepared for UNCTAD in collaboration with the International Association of Ports and Harbors (IAPH)

10

Computerized Container Terminal Management

by

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UNITED NATIONS
New York, 1993

NOTE

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INTRODUCTION TO THE SERIES

UNCTAD has been cooperating with the International Association of Ports and Harbors (IAPH) for many years, in various fields and in particular in the production, translation and distribution throughout the world of technical papers in the form of **Monographs** which help contribute to the development of the management skills needed for the efficient operation of ports in developing countries.

As a result of UNCTAD VIII, new developments have taken place in UNCTAD which has resulted in the adoption of a new work programme in the ports field. It is worth emphasizing that the previous objective of improving the efficiency of ports, on which the UNCTAD/IAPH monograph scheme was based upon, was reaffirmed.

The UNCTAD secretariat is therefore pleased to continue cooperating with IAPH in producing monographs where the practical experience gained by a specific port or individuals is presented for the benefit of the international port community. Such a scheme supplements the other research, training and technical cooperation activities carried out by the UNCTAD secretariat with the objective of fostering competitive maritime and international transport services, strengthen capacities for trade and promoting international cooperation and exchange of expertise. We would like to thank the authors for their contribution to these monographs, all of which have been made on a voluntary basis.

<div align="right">

Y. Berthelot
Deputy Secretary General
UNCTAD

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FOREWORD

When UNCTAD first decided to seek the co-operation of the International Association of Ports and Harbors in producing monographs on port management, the idea was enthusiastically welcomed as a further step forward in the provision of information to managements of ports in developing countries. The preparation of monographs through the IAPH Committee on International Port Development has drawn on the resources of IAPH member ports to record for the benefit of others the experience and lessons learnt in reaching current levels of port technology and management. In addition, valuable assistance has been given by senior management in ports of developing countries in assessing the value of the monographs at the drafting stage.

I am confident that the UNCTAD monograph series will be of value to managements of ports in developing countries in providing indicators towards decision-making for improvements, technological advance and optimum use of existing resources.

The International Association of Ports and Harbors looks forward to continued co-operation with UNCTAD in the preparation of many more papers in the monograph series and expresses the hope that the series will fill a gap in the information currently available to port managements.

Goon Kok Loon
Chairman
Committee on International
Port Development
IAPH

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Chapter I

INTRODUCTION

1.   Container terminals are highly capital intensive. They have to be well managed in order to realize their potential capacity and achieve a reasonable level of efficiency and service performance to their customers. A good management system cannot be done without computerization.

2.   The advancement of Information Technology provides a wide range of options for the container terminal operator to computerize its management system. It can range from a simple data entry and retrieval system with batch or on-line input to a highly sophisticated computer directed real-time operation system. The choice depends on the size of the operation and its projected growth in the medium term.

3.   The Port of Singapore Authority (PSA) has invested over a hundred million Singapore dollars to build up its present suite of computer applications to support container terminal management and operations. Every year, tens of millions of dollars are also spent to maintain these applications to keep them up-to-date with the operational requirements. In 1991, PSA handled 6.35 million TEUs of containers. The number of on-line transactions in the mainframe computer for that year was 240 million. The largest computer file in its database was the container details file which had 50,000 records.

4.   Irrespective of the degree of sophistication adopted, the computerization effort follows a certain methodology. It starts with analyzing the data flows from and to external organizations and data flows within the terminal. From this analysis, the necessary computer processes are identified and the accompanying data files can be created in a database management system.

5.   The degree of sophistication and the extent of computerization adopted will depend on the handling capacity of the terminal and management's inclination in achieving manpower savings. These include manpower for data entry as well as for executing physical tasks in the terminal, such as gate processing and yard and shipside operation supervision.

6.   This monograph describes the development cycle of a computer application and provides an outline for the computerization of some of the core functions in the container terminal. Sample screens and management reports are used to illustrate the development of these applications. It supplements two other studies published by UNCTAD, which are publications TD/B/C.4/AC.7/11 and TD/B/C.4/AC.7/11/Supp.1, entitled "Guidelines for port managers on the use of computers". These publications provide an overview of the general issues involved in computerization of port operations and give detail descriptions of computerized systems for container control, general cargo control and operations of ships in the port.

Chapter II

DEVELOPMENT CYCLE OF A COMPUTER APPLICATION

7.   The development cycle of a computer application consists of eight phases.

8.   The **feasibility study phase** is carried out before resources are committed to the development and implementation of a computer application. The study should include :

    a.   A description of existing procedures;

    b.   An analysis of alternative solutions regarding different types of equipment, programming tools and alternative solutions other than computer applications;

    c.   Benefits evaluation (tangible and intangible);

    d.   Cost evaluation (one-time and recurring);

    e.   Final selection of the solution, considering economic (costs and benefits), technical, operational and environmental factors. The solution must provide benefits, be technically possible to develop and operate smoothly in the user's environment.

The feasibility study ends with a written report which, after the user's acceptance forms a foundation for further development work.

9.   The **system analysis phase** is carried out to obtain a good grasp of the existing work procedures and information flow. This should include :

    a.   A detailed review of the existing system;

    b.   Identification of the system objectives;

    c.   Identification of design constraints;

    d.   Analysis of the information needs and flow

At the end of the system analysis phase, a functional specifications is produced which describes the input, processing and output requirements (information needs) from the perspective of the application user. It forms the basis for further development work, after the user's approval.

10.   The **system design phase** transforms the user requirements contained in the functional specifications into :

    a.   General system design;

    b.   Detailed system design

A decision should be made on whether to create the computer application in-house or buy from outside. Application packages if available, may be lower in cost and reduces the lead time to implement. However, in-house developed application offers greater operating efficiency and can cater to the unique needs of the organization more effectively.

The general system design is derived after considering the alternative approaches to meet the functional specifications. One popular, but less creative approach is to "computerize" the existing

system. That is, to design a system that mirrors the logic and procedures of the existing system. A general system design depicts the relationship between major processing activities and has enough details for the application users to determine whether or not this is what they want. This will include:

a. A graphic illustration that depicts the fundamental operation of the proposed application system;

b. A written explanation of the graphic illustration;

c. General descriptions of the outputs to be produced by the system, including display screens and hard-copy reports and documents.

The detailed system design is prepared after the general system design is approved by the application users. It specifies the detailed input, output, processing and control requirements and is the blueprint for further development work.

In designing the application system it will be necessary to :

a. Institute manual procedures and controls in the system design to ensure data integrity and system security. These would include error detection, redundancy checks and provision for system recovery in the event of failure. Nevertheless, it is essential to strike a balance, to avoid an over-controlled system that is expensive to operate and produces information which is not timely.

b. Strike a balance between a costly/flexible and a cheaper/less flexible design depending on the budget and time allocated for the project since most computer applications are likely to be changed during their useful life. These changes are unforeseen and can be very costly to make.

11. The **system construction phase** converts the detailed design into computer programs. This will involve :

a. Preparation of detailed technical specifications for program development;

b. Program creation, testing and documentation;

c. Final system testing

12. The **user acceptance phase** involves user testing of the developed application to verify that all the specified requirements are met. This is done to obtain the user's approval to proceed with implementation of the application developed.

13. **User training** is carried out to familiarize the user with the operation of the computer application before its implementation. The training session will include :

a. An introduction to the functionality of the application;

b. A demonstration of the application;

c. An introductory hands-on walk-through of the application;

d. Familiarization with the application through hands-on practice session using test data.

14.   A **post-implementation review** is conducted three to six months after the application is put into production. It is a critical examination of the application. The gestation period is necessary to allow several factors to stabilize: the resistance, anxieties and the learning curve of the system user. It also allows time for unanticipated problems to surface.

15.   Once an application system is implemented and goes on-line, the application enters the **system maintenance phase**. An application system is dynamic and must be responsive to the changing needs of the organization. There are two approaches to system maintenance :

    a.   Reactive approach which is the least desirable. This involves doing nothing to the application unless requested to do so by the people who use it.

    b.   Proactive approach which is more effective. This requires the application to be reviewed once or twice or a year by a review team made up of analysts and users. The team will interview users of the application at all levels, from clerks to executive management and information technology professionals assigned to the system. The focus of the interviews is system efficiency and effectiveness and how the system can be improved.

16.   An application system cannot live forever. The accumulation of modifications and enhancements over time will eventually make the application system cumbersome and inefficient. In general, an application system will remain useful for four to seven years. Toward the end of the useful life it will be cumbersome to change and is better to redesign the system from scratch. This is the "death" stage of the application cycle. A new application is then "born" and the application development cycle is repeated.

Chapter III

SYSTEM REQUIREMENTS FOR CONTAINER TERMINAL MANAGEMENT

17.   Many processes in container terminal management can be computerized to increase the operational efficiency of the terminal. The degree of computerization adopted depends on the benefits which again depends on the projected level of activity, handling capacity of the terminal, management's inclination in achieving manpower savings and other environmental factors such as cooperation from the shipping community, the labour union and government regulatory bodies.

18.   Generally, computerization should reduce the manual effort and paper flow, facilitate timely information flow among parties and enhance control and quality of service and decision made. The main benefits provided by a computer application in container terminal management are :

-    Faster discharging and loading of containers;

-    Increased productivity through faster turnaround of containers;

-    Better monitoring of the storage of containers;

-    Better utilization of terminal resources;

-    High level of accuracy of information;

-    High level of consistency of the information used by various departments of the terminal;

-    Relieve the pressure of time-critical documentation and clerical workload;

-    Better service for customers through more accurate and easily accessible information about a desired operation;

-    Speeding up of invoices and thus income, if defined routines exist to translate operational events recorded in the computer into charges to the customer.

19.   The information flow into and out of the container terminal has to be mapped out. Generally, for a typical terminal the flows are depicted below.
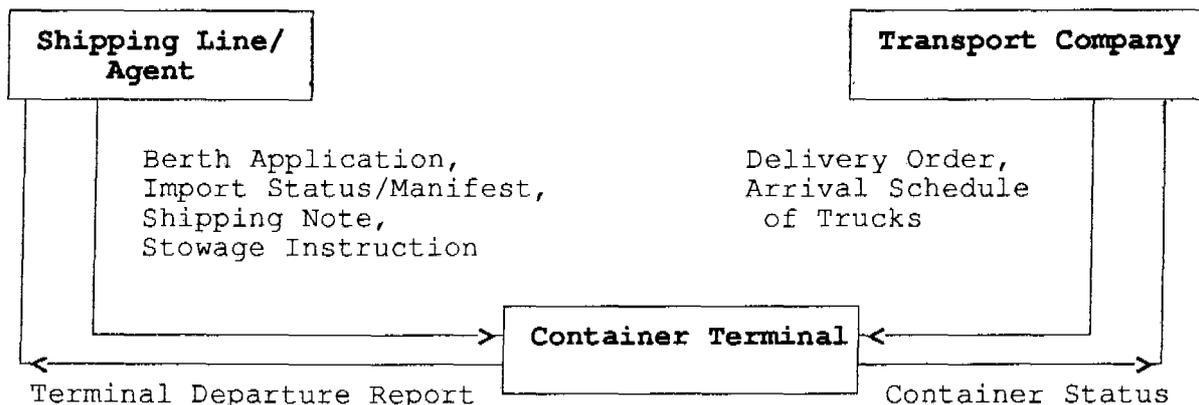
20. The core applications for Container Terminal Management can be grouped into :

    a.   Logistics Control;

    b.   Container Control;

    c.   Ship Operations Control;

    d.   Container Terminal Performance Control.

Chapter IV

COMPUTERIZATION OF LOGISTICS CONTROL

21.   Logistics control involves maintenance, planning and controlling the use of the expensive resources of the terminal such as berths, container stacking yard, container handling equipment and manpower.

22.   An application module for **berth allocation** maintains information on past and berth usages and planned occupancy of the berths by incoming ships. Reports are produced to assist decision making on berth assignments. Berth assignments are validated to ensure that marine safety and other physical constraints are observed.

Inputs to the module will include berth application from shipping line/agent, current and planned occupation of the berths.

Outputs from the module will include a vessel schedule, berthing schedule and berthing chart. Samples of computer screen/report are given below. The annex gives an explanation of the abbreviations used in the screens.

    a.   <u>Berth application screen</u>

        This captures details of berth application submitted by shipping line/agent.

```
                    Berth Application       03/06/92-1220

      VSL/VOY     : SD STAR      123N   A/C          : 375811
      GRT         : 4536               TYPE          : CF
      LOA         : 119 m              AGT           : SEA-LAND

      BTR         : 060692 0700        P FR          : PHMNL
      ETU         : 060692 2359        P TO          : MYPKG
      BTH DFT     : 8.6 m              UNBTH DFT  :  8.6 m
      WHARFSIDE   : PORT

                   - CNTR DISC -    - CNTR LOAD-
                     20FT 40FT        20FT 40FT

      LADEN (GP) :    100   30         160    20
      MT         :     10    5          10     3
      HAZARDOUS  :      5    3           2     4
      OH         :      2    2           1     0
      OW         :      0    1           0     1
```

b.   Berth allocation screen

    This captures details of berth assignment to a vessel.

```
                    Berth Allocation        03/06/92-1220

    VSL/VOY      : SD STAR     123N   A/C        : 375811
    GRT          : 4536              TYPE        : CF
    LOA          : 119 m             AGT         : SEA-LAND

    ETB          : 060692 0700       BTH NO      : C03
    WM FR        : 340               WM TO       : 459
    WHARFSIDE    : PORT
    CRANES       : 31 32
    ETC          : 060692 2330
```

c.   Vessel berthing screen

    This captures details of vessel which have berthed alongside.

```
                    Vessel Berthing         06/06/92-0710

    VSL/VOY      : SD STAR     123N   TYPE       : CF
    GRT          : 4536              A/C         : 375811
    LOA          : 119 m             AGT         : SEA-LAND

    ATB          : 060692 0700       BTH NO      : C03
    WM FR        : 340               WM TO       : 459
    WHARFSIDE    : PORT
```

d.   Vessel unberthing screen

    This captures details of vessel which have unberthed.

```
                    Vessel Unberthing       07/06/92-0040

    VSL/VOY      : SD STAR     123N   TYPE       : CF
    GRT          : 4536              A/C         : 375811
    LOA          : 119 m             AGT         : SEA-LAND

    ATU          : 060692 2330       BTH NO      : C03
    WM FR        : 340               WM TO       : 459
    WHARFSIDE    : PORT
```

e.   Vessel schedule screen

This shows the berth application details of vessels which have applied for berths in chronological order of vessel's BTR (Berth Time Required) to facilitate assignment of berths by the berth planner.

```
   Vessel Schedule 05/06 to 06/06    03/06/92-1220

VSL/VOY           TYPE   BTR       P FR     DISC  BTH/UNBTH
                  LOA    ETU       P TO     LDG   DFT

MS GLORY  23      C2     05/2300   MYPNG    199   8.8
                  169    06/0700   THBKG    216   8.9

SD STAR   123N    CF     06/0700   PHMNL    121   8.6
                  119    06/2359   MYPKG    139   8.6

MV STAR   45W     CF     06/0800   THBKG    110   8.5
                  110    06/2359   THBKG    100   8.4

N TOPAZ   83S     C2     06/0700   HKHKG    220   8.9
                  159    06/2359   TWKSH    200   8.8
```

f.   Berthing Chart

This shows a graphical layout of vessel assignments to available berths.

```
         Berthing Chart          03/06/92-1220

Date     05/06                 06/06
Time     0700    1500   2300   0700   1500    2300
Bth/—0
WM        |      ┌──────────┐  ┌──────────────┐
          |      │  Vsl A   │  │  Vsl B       │
C01 —300  |      └──────────┘  └──────────────┘
          |     ┌──────┐ ┌──────────────┐
          |     │Vsl C │ │  Vsl D       │     ┌──────────────┐
C02 —600  |     └──────┘ └──────────────┘     │              │
          |                                   │  Vsl E       │
C03 —900  |                                   └──────────────┘
```
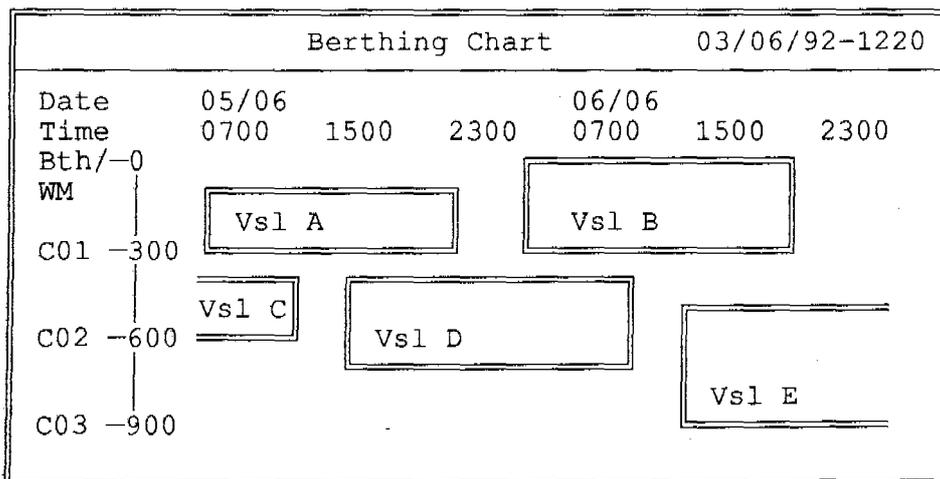
g.   Berthing schedule screen

This shows the schedule of vessels berthing at the terminal in chronological order of vessel's ETB (Estimated Time of Berthing, ie date/time a berth is assigned to the vessel).

```
    Berthing Schedule 05/06 to 06/06    03/06/92-1220

   VSL/VOY           TYPE   ETB      DISC  BTH/WM   CRANES
                     LOA    ETC      LDG   FR   TO  ASSGN

   MS GLORY  23      C2     05/2300  199   C03       15,16,17
                     169    06/0600  216   410  579

   SD STAR   123N    CF     06/0700  121   C02       13,14
                     119    06/2330  139   270  389

   MV STAR   45W     CF     06/0830  110   C01       11,12
                     110    06/2359  100   030  140

   N TOPAZ   83S     C2     06/0700  220   C03       15,16,17
                     159    06/2300  200   410  569
```

23.   An application module for **yard allocation** maintains a profile of all the yard space in the terminal and information on the allocation of yard space to ships. The system tracks the balance of yard space reserved in relation to the actual volume and mix of inland export containers received to-date.

Inputs to the module will include the profile of yard space in the terminal, yard space allocation to incoming ships and yard space freed by outgoing ships.

Outputs of the module will report on the yard space allocated and their balance. Samples of computer screen/report are given below.

a.   Yard Profile screen

This captures details of yard blocks in the terminal.

```
               Yard Profile            03/06/92-1220

   YARD BLOCK    : J
   ROW FROM      : 21
   ROW TO        : 28
   YARD TYPE     : SC   (Straddle Carrier)
   MAX GRD LOAD  : 299  (Metric Tonnes)


   SLOT   SLOT   MAX   EQPT   EAT   CNTR
   FROM   TO     HGT   TYPE   SEQ   TYPE

      1   14     3     SC     B     GP
     15   28     3     SC     S     OH OW FR
```

b.   Yard allocation screen

    This captures the yard ranges allocated to each vessel berthing at the terminal.

```
                   Yard Allocation          03/06/92-1220

VSL/VOY :  SD STAR      123
                                YD    ROW        SLOT
        PORT      SZ   CAT   WC  BLK   FR  TO    FR  TO  HIGH

     1  DEHAM      2   AB    X   U    02          08        4
     2  DEHAM      2   GP    M   W    01  06    01  02      4
     3  DEHAM      2   GP    H   W    01  06    03  04      4
     4  DEHAM      4   GP    M   W    01  06    05  06      4
     5  DEHAM      4   GP    H   W    01  06    07  08      4
     6  DEHAM      2   OW    H   Z    03  03    01  04      1
```

c.   Yard allocation and balance screen

    This shows the yard ranges allocated to a vessel, the number of slots occupied and the balance left for incoming containers.

```
        Yard Allocated and Balance        03/06/92-1220

VSL/VOY : SD STAR      123
                        YD    ROW      SLOT        NO. SLOTS
        PORT /SZ/CAT/WC BLK  FR  TO   FR  TO   HT  OCCP    BAL

     1  DEHAM/2 /AB /X  U    02       08        4   02      02
     2  DEHAM/2 /GP /M  W    01  06   01  02    4   36      12
     3  DEHAM/2 /GP /H  W    01  06   03  04    4   15      33
     4  DEHAM/4 /GP /M  W    01  06   05  06    4   05      19
     5  DEHAM/4 /GP /H  W    01  06   07  08    4   20      04
     6  DEHAM/2 /OW /H  Z    03 03    01  04    1   03      01
```

24.   An application module for **manpower roster/deployment** maintains a roster of the staff available for deployment. The module derives the staff roster, plans or alternatively captures the manpower deployment plan worked out manually. The module keeps track of work done by each of the staff and facilitates computation of staff remuneration.

Inputs to the module will include staff details, staff roster and deployment plan. Outputs of the module include the staff roster and manpower deployment plan. Samples of computer screen/report are given below.

a.   Staff record screen

     This captures details of each operations staff of the terminal.

```
┌────────────────────────────────────────────────────────────┐
│              Staff Record            03/06/92-1220          │
│                                                             │
│                                                             │
│    STAFF NO        :  AB123                                 │
│    NAME            :  JOHN TAN                              │
│    EFFECTIVE DATE  :  01/06/85                              │
│    JOB FUNCTION    :  C  (Container Machine Operator)       │
│    SECTION/UNIT    :  S1 (Section 1)                        │
│    RELIGION        :  B  (Buddhist)                         │
│                                                             │
│    SKILLS          :  QC (Quay Crane)                       │
│                       YC (Yard Crane)                       │
│                       SC (Straddle Carrier)                 │
│                                                             │
└────────────────────────────────────────────────────────────┘
```

b.   Staff roster screen

     This captures the roster of each operations staff of the terminal.

```
┌────────────────────────────────────────────────────────────┐
│              Staff Roster            03/06/92-1220          │
│                                                             │
│   STAFF NO :  AB123            NAME  :  JOHN TAN            │
│                                                             │
│                        P          1                    2    │
│   JULY 92     │ 1 2 3 4 5 H 7 8 9 0 1 2 3 4 5 6 7 8 0       │
│  ─────────────┼──────────────────────────────────────      │
│   GRP ROSTER  │ 3 0 2 2 R 1 1 3 3 0 2 2 R 1 1 3 3 0 2       │
│   INDV ROSTER │     1             2                         │
│   LEAVE CODE  │                             V V             │
│   LIGHT DUTY  │                                             │
└────────────────────────────────────────────────────────────┘
```

c.   Staff deployment screen

     This captures details of the staff deployment to support terminal operations.

```
┌────────────────────────────────────────────────────────────┐
│              Staff Deployment        03/06/92-1220          │
│                                                             │
│                                                             │
│    STAFF NO        :  AB123                                 │
│    NAME            :  JOHN TAN                              │
│    JOB FUNCTION    :  C  (Container Machine Operator)       │
│    SKILLS          :  QC (Quay Crane)                       │
│                       YC (Yard Crane)                       │
│                       SC (Straddle Carrier)                 │
│                                                             │
│    ROSTER DTE/SHFT:   04/06/92 1                            │
│    DEPLOYMENT AREA:   QC 12                                 │
│                                                             │
└────────────────────────────────────────────────────────────┘
```

d.   Manpower deployment list

This shows the overall deployment of operations staff to support terminal operations in a shift. For example, the deployment of manpower to support ship operations.

```
            Manpower Deployment Plan      03/06/92-1900

    DATE :   04/06/92   SHIFT : 1
```

CRANE	VESSEL(S)	OPTR	TA WHARF	TA SHIP	PM DRIVERS	
11	SIRI BHUM EAGLE BREEZE	SD142	ND033	ND111	PD479 PD102	PD770 PD542
12	SIRI BHUM EAGLE BREEZE	SD153	ND022	ND080	PD071 PD391	PD080 PD550
13	MS TAURO METTE MS	SD053	ND161	ND220	PD506 PD503	PD317 PD626
14	MS TAURO METTE MS	SE102	NE123	NE324	PE320 PE335	PE319 PE336

25.   An application module for **equipment deployment** maintains record of the type and quantity of equipment available for deployment and details of equipment utilization. The module plans or alternatively captures the deployment plan worked out manually. Samples of computer screen/report are given below.

a.   Equipment record screen

This captures details of each container handling equipment in the terminal.

```
              Equipment Record          03/06/92-1220


    EQPT NO          :   YC001
    EQPT TYPE        :   YC (Yard Crane)
    EFFECTIVE DATE   :   01/06/85
    NO ROWS ACROSS   :   06
    NO TIERS         :   05
    ASSET NO         :   34111
    MANUFACTURER     :   MITSUBISHI
```

b.   Equipment deployment screen

This captures the deployment of the equipment to support terminal operations or for preventive maintenance.

```
┌─────────────────────────────────────────────────────────────┐
│ ┌───────────────────────────────────────────────────────┐   │
│ │  Equipment Deployment Record          03/06/92-1220   │   │
│ │                                                       │   │
│ │                                                       │   │
│ │   EQPT NO        :  YC001                             │   │
│ │   NO ROWS ACROSS :  06                                │   │
│ │   NO TIERS       :  05                                │   │
│ │                                                       │   │
│ │   DATE/SHIFT     :  04/06/92 1                        │   │
│ │   DEPLOYMENT AREA:  BLK W                             │   │
│ │                                                       │   │
│ └───────────────────────────────────────────────────────┘   │
└─────────────────────────────────────────────────────────────┘
```

c.   Equipment deployment list

This shows the overall deployment of container handling equipment for preventive maintenance and repair and to support terminal operations in a shift.

	Equipment Deployment Plan				03/06/92-1900				
DATE : 04/06/92 SHIFT : 1								
SC	AREA	OPTR	YC	AREA	OPTR	YC	AREA	OPTR
001	BLE	TE021	001	BLR	PF033	016	BLR	TD010
002	B/D	–	002	BLS	PF077	017	BLS	TD217
003	RYD	TE178	003	BLT	PF247	018	P/M	–
004	BLG	TE110	004	BLU	PF271	019	BLU	TE126
005	P/M	–	005	BLV	PF448	020	BLV	RE245
006	BLF	TF422	006	BLW	PE364	021	BLD	TE093
007	BLH	TF074	007	BLX	PE023	022	BLE	RE095
008	SBY	–	008	P/M	PE422	023	SBY	–
009	RYD	TF066	009	BLY	LD057	024	BLY	TE827
010	BLN	TF430	010	BLZ	LD650	025	BLZ	TE453
			011	B/D	–	026	RYD	RF230
FM	AREA	OPTR	012	RYD	TF870	027	B/D	–
			013	BLA	TF163	028	BLA	TD910
001	BLY	LD023	014	BLB	TD888	029	BLB	TF186
002	P/M	–	015	BLC	TE568	030	P/M	–

d.   Equipment utilization screen

This captures details of equipment utilization during one of the operational shift.

```
Equipment Utilization Record           03/06/92-1900

EQPT NO            :  YC001

DATE/SHIFT         :  03/06/92  1
EQPT OPTR          :  LD023

 TIME              OPERATIONS
FR    TO           CODE

0700 0830          01   (Ship - Discharging Operations)
0830 1000          11   (Yard - Receiving Operations)
1000 1100          01   (Ship - Discharging Operations)
1100 1145          99   (Standby for Meal Break)
1145 1230          02   (Ship - Loading Operations)
1230 1300          12   (Yard - Shifting Operations)
1300 1400          02   (Ship - Loading Operations)
1400 1500          98   (Standby for Operations)
```

Chapter V

COMPUTERIZATION OF CONTAINER CONTROL

26.   Container control involves the receiving of export container from inland and import container discharged from ships at a port. It also involves the releasing of import container to consignee and loading of the export container onto ships at a port.

27.   The relatively short turnaround time of the vessels demands an up-to-date record of the containers received, released and stored in the terminal. Keeping an up-to-date manual record would be very labour intensive and tedious. The massive volume of information to be maintained warrants the use of a computer system to reduce the manual effort to ensure accuracy in the information recorded. An up-to-date inventory of containers and their locations in the yard speeds up operations when a specific container has to be retrieved. Special emphasis should be given to obtain information of containers in advance for planning of ship operations, so that ship operations can start upon berthing of the vessel.

28.   An application module for **container documentation** maintains records of requests for shipment, discharge and delivery of containers. The module produces documentary proof for purpose of control on the entry and exit of containers from the terminal gate.

Inputs to the module will include shipping note, import status or manifest and delivery order. Outputs of the module include an equipment interchange receipt. Samples of computer screen/report are shown below.

    a.   Import container record screen

           This captures the details of each container declared for discharge from a vessel at the terminal.

```
 Import Container Record                    03/06/92-1220

    VSL/VOY     : AXEL MS     9112
    CNTR NO     : MAEU 5025945      CELL NO : 090106
    CNTR OPTR   : MS               STATUS   : F (L/E/F)
    PLOAD       : IDPKU             SIZE     : 2
    WEIGHT      : 18000             DG       : N (Y/N)

    RF TEMP     :   (+/-)    (C/F)
    O-WIDTH     :            (C/I)
    O-HEIGHT    :            (C/I)
    O-LENGTH    :            (C/I)
    OTH-SP-DTL:
```

b.   Export container record screen

This captures the details of each container declared for shipment on a vessel at the terminal.

```
┌─────────────────────────────────────────────────────────┐
│  Export Container Record              03/06/92-1220      │
│                                                          │
│   VSL/VOY     : BALTIMAR SUN 92/06                       │
│   CNTR NO     : NOSU 2175226                             │
│   CNTR OPTR   : NA              STATUS  : F  (L/E/F)     │
│   PLOAD       : IDPKU           SIZE    : 2              │
│   WEIGHT      : 18000           DG      : N  (Y/N)       │
│                                                          │
│   RF TEMP     :   (+/-)    (C/F)                         │
│   O-WIDTH     :            (C/I)                         │
│   O-HEIGHT    :            (C/I)                         │
│   O-LENGTH    :            (C/I)                         │
│   OTH-SP-DTL:                                            │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

c.   Container delivery screen

This captures details of request to deliver container from the terminal.

```
┌─────────────────────────────────────────────────────────┐
│  Container Delivery Request            03/06/92-1220     │
│                                                          │
│   CNTR NO    : NOSU 2175226                              │
│   DELV DATE  : 04/06/92      DELV TIME : 1000 - 1200     │
│   HAULIER    : ACS                                       │
│   DELV ORDR  : 92/56/034                                 │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

d.   Import container list

This shows the containers declared for discharge from a vessel.

```
┌─────────────────────────────────────────────────────────┐
│  Import Container List                 03/06/92-1220     │
│                                                          │
│   VSL/VOY     : TAHAN AIR        74S                     │
│                                                          │
│   CNTR NO        CELL NO OPTR ST PLOAD  SZ WT      DG    │
│                                                          │
│   MAEU 5025945   090106  MS   F  IDPKU  2  18.0    N     │
│   ICSU 4148175   090206  MP   F  IDPKU  2  19.5    N     │
│   BARU 3312442   090306  MP   F  IDPKU  2  16.0    N     │
│   TPHU 6182612   090406  MP   F  IDPKU  2  14.0    N     │
│   XLCU 2089453   090506  NL   F  IDPKU  2  23.0    N     │
│   TPHU 6026862   090606  SB   F  IDPKU  2  17.0    N     │
│   XCLU 2082295   090706  SB   F  IDPKU  2  12.4    N     │
│   TRIU 2929323   090204  NL   F  IDJKT  2  19.9    N     │
│                                                          │
└─────────────────────────────────────────────────────────┘
```

e.   Equipment interchange receipt

This shows the details of container to be received at or to be released from the terminal gate. It serves as a documentary proof for purpose of control on entry and exit.

EQUIPMENT INTERCHANGE RECEIPT		Serial No : 123456K	
(to be filled in by person effecting shipment/delivery)	Weighbridge Figures		
	Overall Weight		
DECLARATION	Chassis Weight		
Haulier .... signature	Prime Mover Wt		
Seal No :	Gross Cntr Wt		
.... Date/Time Name & NRIC No	Condition Codes		
	o Damage o Hole o Cut o Dent o Part Missing		
.... staff signature Employee No	Container No	ICSU 4920756	
Vessel/Voyage SIRI BHUM 12N	Special Details		
Cntr Sz/Status/Wt 2/F/24000	Yard Location		
Haulier ACS	Date/Time Processed		
Date/Time In	Date/Time Offloaded		
Date/Time Mounted	Date/Time Out		

29.   An application module for **gate management** controls the arrival and exit of containers at the terminal gate. Samples of computer screen/report are shown below.

a.   Export receiving screen

This shows the schedule available for hauliers to bring in inland export containers to the terminal for storage prior to their loading.

```
Export Receiving Schedule          03/06/92-1220

Schd Date : 04/06/92

VSL/VOY              ETB      SNO   BOOKING AVAIL

AKA BHUM      482N   04/1900   1    40
AL WAJBA      58     04/1900   1    20
BENALDER      106    04/2100   2    40
P GARFIELD    046N   05/0700   3    20
NEW GENLORD   5691   05/0700   3    20
TAKARI IV     4078   05/0900   3    20
```

b.   Delivery schedule screen

This summarises the number of containers requested for delivery from the terminal gate.

```
Delivery Schedule                    03/06/92-1220

Schd Date : 04/06/92

TIME  FR/TO      NO 20-FT   NO 40-FT

0700 - 0759     20          10
0800 - 0859     32          12
0900 - 0959     40          21
1000 - 1059     30          29
1100 - 1159     28          20
1200 - 1259     17          09
1300 - 1359     10          05
```

c.   Container arrival screen

This captures details of a container which has arrived at the terminal gate for storage or for direct loading at the shipside.

```
Container Arrival Record             03/06/92-1220

DATE/TIME        : 03/06/92 1220
CONTAINER NO     : ICSU 4920756
CONDITION CODE   : D (Dent)
CONTAINER WT     : 24000
YD RANGE ASSGN   : Blk W  Row 5  Slot 05  High 4
```

d.   Container exit screen

This captures details of a container which is brought to the terminal gate for delivery from the terminal.

```
Container Exit Record                03/06/92-1220

DATE/TIME        : 03/06/92 1220
CONTAINER NO     : XCLU 2082295
CONDITION CODE   :
```

30.   An application module for **yard management** maintains record of containers stacked in the terminal yard. Reports are produced by the system to monitor the stay of containers in the yard. Samples of computer screens/reports are shown below.

a.   Container movement screen

This captures the last known location of the container in the terminal yard.

```
+----------------------------------------------------------+
|                                                          |
|   Container Movement Record         03/06/92-1230        |
|                                                          |
|   CONTAINER NO    :  ICSU 4920756                        |
|   YARD LOCATION   :  W05051                              |
|                                                          |
+----------------------------------------------------------+
```

b.   Container record screen

This shows the details of each container record maintained in the computer system.

```
+----------------------------------------------------------+
|                                                          |
|   Container Record                  03/06/92-1240        |
|                                                          |
|   CONTAINER NO : ICSU 4920756    YD LOCN :  W05051       |
|   LDG VSL/VOY  : SIRI BHUM 12N   CNTR SZ :  2            |
|   CNTR STATUS  : F               CNTR WT :  24000        |
|   CNTR OPTR    : NP              COND    :  Dent         |
|   HAULIER      : ACS             ARRIVED :  Y            |
|   SP DETAILS   :                 PDISC   :  MYBKI        |
|   DG-IMO-CLASS :                 STOW CAT:  GP           |
|   REEFER TEMP  :                                         |
|   O-WIDTH      :                                         |
|   O-HEIGHT     :                                         |
|   O-LENGTH     :                                         |
|                                                          |
+----------------------------------------------------------+
```

c.   Yard layout screen

This shows a pictorial view of container lying within a specified yard range.

```
+----------------------------------------------------------+
|  Yard Layout Blk W Row 05 Slot 05-06  03/06/92-1245     |
|                                                          |
|  Row 05      Slot 05            Slot 06                  |
|  +-----+--------------------+--------------------+       |
|  |     |                    |                    |       |
|  |  4  |                    |                    |       |
|  +-----+--------------------+--------------------+       |
|  |     |                    | NYKU 6741293       |       |
|  |  3  |                    | F/2/18000/GP       |       |
|  +-----+--------------------+--------------------+       |
|  |     |                    | MOLU 5006809       |       |
|  |  2  |                    | F/2/17000/GP       |       |
|  +-----+--------------------+--------------------+       |
|  |     | ICSU 4920756       | NOSU 2175226       |       |
|  |  1  | F/2/24000/GP       | F/2/18000/GP       |       |
|  +-----+--------------------+--------------------+       |
|                                                          |
+----------------------------------------------------------+
```

d.   Container lying screen

This shows the details of containers lying in the terminal yard beyond a specified number of days.

```
Container Lying Beyond 7 days          03/06/92-1245

CONTAINER NO    VSL/VOY              DAYS    REMARKS

NOSU 2175226    TAHAN AIR     74S    7       SHUT-OUT
TPHU 2873914    TAHAN AIR     74S    7       SHUT-OUT
GSTU 4648297    AYSEN         20N    7       BTR DELAYED
GSTU 4617300    AYSEN         20N    7       BTR DELAYED
CTIU 1907228    AYSEN         20N    7       BTR DELAYED
NEPU 2444141    LLOYDIANA     30D    7       SHUT-OUT
LTIU 4235677    LLOYDIANA     30D    8       SHUT-OUT
LTIU 4235614    LLOYDIANA     30D    8       SHUT-OUT
```

Chapter VI

COMPUTERIZATION OF SHIP OPERATIONS CONTROL

31.   Ship operations control involves planning, executing and monitoring the loading/discharging operations of ships at a port.

32.   To ensure that ships are turned around within it allocated port time, it is essential to pre-plan an efficient sequence of ship operations and monitor closely the progress of operations. For marine safety, it is also critical that the discharging and loading activities are carried out in a manner which ensures the stability of the ship whilst alongside. Ships must also sail in a stable condition for its voyage to the next port, therefore, computation of the ship's trim and stability is essential.

33.   An application module for **discharge planning** plans the sequence of discharge of container from a ship taking into consideration the ship structure and stowage of containers on board the ship. Samples of   computer screen/report are shown below.

    a.   Discharging list

        This provides instructions to discharge containers from a ship.

```
┌─────────────────────────────────────────────────────────────────┐
│                                                                   │
│  Discharging List                           04/06/92-1200         │
│                                                                   │
│  VSL/VOY    :  MS FARCO  9022   BAY : 30H    SZ : 4               │
│  CRANE SEQ  :  1/020                                              │
│                                                                   │
│  DISC  WT   CNTR NO        ACTUAL YD LOCN/           CNTR         │
│  SEQ        CELL     ST    YD RANGE ASSGN            COND         │
│                                                                   │
│  1     3.5  MAEU 4005631   ( )( )( )( )                           │
│             300610     E   Y R 21-29 S 09-10 5 H                  │
│                                                                   │
│  2     3.5  MAEU 2530136   ( )( )( )( )                           │
│             300510     E   Y R 21-29 S 09-10 5 H                  │
│                                                                   │
│  3     3.5  MAEU 2069480   ( )( )( )( )                           │
│             300410     E   Y R 21-29 S 09-10 5 H                  │
│                                                                   │
│  4     3.5  MAEU 2021268   ( )( )( )( )                           │
│             300310     E   Y R 21-29 S 09-10 5 H                  │
│                                                                   │
│  5     3.5  MAEU 2089669   ( )( )( )( )                           │
│             300210     E   Y R 21-29 S 09-10 5 H                  │
│                                                                   │
└─────────────────────────────────────────────────────────────────┘
```

34.   An application module for **stowage planning** assists the planner in picking export containers from the terminal yard and loading them onto the ship.

Inputs to the module include export container records, ship profile and stowage instruction. Outputs from the module include wharf tickets, loading list, loading bay plan and terminal departure reports. Samples of computer screens/reports are shown below.

a.   Wharf ticket

This is printed for each export container declared for shipment on a ship. It contains the details of the container essential for ship planning. The ship planner fills in the vessel cell location and the loading sequence.

		Wharf Ticket
Container No	Vessel Name	Voyage No
OLCU 2101864	ANRO AUST	16715
Yard Location	Port of Discharge	Wt Class
E 32 45 1	AUSMB	M
Vsl Cell No	Loading Sequence	Size/Type
Bay Row Tier		2200

b.   Loading list

This provides instructions on the sequence of picking export containers from the terminal yard and loading them to specific cell locations on board the ship.

```
Loading List                            03/06/92-1445

Vessel/Voyage :   Baltimar Sun   92/06

Bay : 11D           Crane Sequence : F040    Sz : 2

SEQ  CNTR NO        OP   YD LOC   CELL     WT      PDISC

 01  IEAU 2067603   KH   U83392   110182   20.5    IDPKU

 02  GLDU 0102472   KH   U84392   110282   19.3    IDPKU

 03  TPHU 6537991   KH   U83322   110382   19.5    IDPKU

 04  TPHU 6559563   KH   U84324   110482   19.1    IDPKU

 05  KHLU 9023005   KH   U81363   110582   16.5    IDPKU

 06  ICSU 4746670   KH   U82382   110682   20.4    IDPKU
```

c.   Loading bay plan

This provides a pictorial view of containers to be loaded on board a ship.

```
Loading Bay Plan                    03/06/92-1645

Vessel/Voyage : Baltimar Sun  92/06    Bay : 11D

┌─────────┬─────────┬─────────┬─────────┬─────────┬─────────┬──────────┐
│PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │TIER:84   │
│    HLCU │    BENU │    HLCU │    OCLU │    HLCU │    OCLU │          │
│2081820  │2323011  │2045274  │0669896  │2355562  │0771383  │30.63KG   │
│HL   5.7 │BC   3.6 │IH   5.0 │PO   4.0 │HL   6.0 │PO   3.1 │ *  27.4T │
│110584   │110384   │110184   │110284   │110484   │110684   │    839MT │
├─────────┼─────────┼─────────┼─────────┼─────────┼─────────┼──────────┤
│PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │PKU/SIN  │TIER:82   │
│    KHLU │    TPHU │    IEAU │    GLDU │    TPHU │    KHLU │          │
│9023005  │6537991  │2067603  │0102472  │6559563  │9023005  │28.01KG   │
│KH  16.5 │KH  19.5 │KH  20.5 │KH  19.3 │KH  19.1 │KH  16.5 │ *111.4T  │
│110582   │110382   │110182   │110282   │110482   │110682   │   3120MT │
├─────────┼─────────┼─────────┼─────────┼─────────┼─────────┼──────────┤
│   4.93TG│   2.46TG│   2.46TG│   4.93TG│   9.85TG│   7.93TG│TOTAL     │
│ * 22.2T │ * 23.1T │ * 25.5T │ * 23.3T │ * 25.1T │ * 19.6T │138.8T    │
│   109MT │    56MT │    63MT │   114MT │   247MT │   155MT │4013MT    │
└─────────┴─────────┴─────────┴─────────┴─────────┴─────────┴──────────┘
Row : 05 Row : 03 Row : 01 Row : 02 Row : 04 Row :06
```

d.   Terminal departure report

This provides information on the discrepancies of containers discharged, ie overlanded or shortlanded; summary of loadings at the terminal and details of containers loaded at the terminal, with a separate listing for each type of special containers such as reefers, uncontainerized cargo, dangerous goods, etc. An extract of the sample report is shown below.

```
Terminal Departure Report          03/06/92-1245

1.   VSL/VOY :  BREMEN EX    03/026

2.   CONTAINER SHORTLANDED / OVERLANDED :

     CNTR NO          CELL       REMARKS
     HLCU 2621927     020582     Shortlanded
     HLCU 2061969     020582     Overlanded

3.   LOADING SUMMARY :

                    HL        MO        NY       TOTAL
     EUHAM
     20/40 LADEN    149/ 95   31/ 29   62/ 16   242/140
     TOTAL WT       2116.9    670.1    667.5    3454.5

     EULEH
     20/40 LADEN    55/ 24    14/ 24   15/ 14   84/ 62
     TOTAL WT       719.2     421.9    225.5    1366.6

     EURTM
     20/40 LADEN    32/ 11    34/ 11   35/ 30   101/ 52
     TOTAL WT       389.0     341.8    649.3    1380.6

     TOTAL (EUROPE)
     20/40 LADEN    236/120   79/ 64   112/ 60  427/244
     TOTAL WT       3225.1    1433.8   1542.3   6201.7
```

```
Terminal Departure Report              03/06/92-1245

4.   COASTAL LADEN CONTAINER DETAILS FOR EUHAM :

     OP CNTR NO        CELL    G.WT  REMARKS

   1 NY NYKU 6630984   420286  12.7
   2 NY NYKU 6730129   420486  10.1
   3 NY NYKU 6586270   420686   9.5
   4 HL HLCU 2056643   451286   5.6
   5 HL HLCU 2938940   471282  12.8
   6 HL HLCU 2017776   471184   6.7
   7 HL HLCU 2061296   471284   6.5
   8 NY NYKU 2166134   490582   7.1

5.   REEFER CONTAINER :

     OP CNTR NO        CELL    PDISC  G.WT REMARKS

   1 MO MOLU 5063579   140484  EUHAM  10.3 C-21-21
   2 HL HLCU 2707088   390282  EUHAM  12.4 C+01+01
   3 HL HLCU 2705634   390482  EUHAM  10.0 C+02+02
   4 HL HLCU 2703267   510582  EURTM  24.5 C+03+03

6.   DANGEROUS GOODS :

     OP CNTR NO        CELL    PDISC  G.WT IMO

   1 MO TRIU 2517417   391082  EUHAM  11.0 6.1
   2 HL HLCU 2352202   510882  EUHAM  11.5 2.2
   3 HL HLCU 2904180   570718  EUHAM   7.0 4.1

7.   UNCONTAINERIZED CARGO :   NIL

8.   OVERSIZED CONTAINER :   NIL
```

35.   An application module for **trim and stability** computes the trim and stability of the ship.

Inputs to the module include the ship's arrival and departure tank conditions, transit, discharge nd loading weight summary. Output from the module is the trim and stability report. Samples of computer screen/report are shown below.

a.   Transit weight screen

This captures the transit container weight summary.

```
           Transit Weight                03/06/92-1245

  VSL/VOY :  B KENARI     245        BAY :  23H

  PORT                          STBD         TIER
   08   06   04   02   01   03   05   07     WT   NO

    0    0    0    0    0    0    0    0      0    10
    0    0    0    0    0    0    0    0      0    08
  12.9 11.1  9.0 11.0 10.0 12.0 13.5 11.5   91.0  06
  11.9 12.1  8.0 12.0 10.0 11.0 14.5 10.5   90.0  04
  13.1 12.1 10.0 12.4 14.2 12.3 15.2 12.2  101.5  02
```

b.   Trim and stability report

This shows the ship's computed trim and stability statement. An extract of the statement is shown below.

```
 Trim & Stability Statement                03/06/92-1900

 VSL/VOY   :   WANA BHUM      11N

 BAY-NAME    WEIGHT   V-MOMENT    L-MOMENT      LCG
 01D            0.0          0           0    55.49-
 01H            0.0          0           0    55.22-
 07D           16.0        267         88-     5.53-
 07H          206.2        775      1,105-     5.36-
 09H            0.0          0           0     1.72
 09D          218.5        927         354     1.62
 11D            0.0          0           0     7.86
 11H          241.1      1,032       1,919     7.96
 13D           61.9      1,034       1,525    24.63
 13H          444.7      2,179      10,926    24.57

   L O A D E D   S H I P   S U M M A R Y
   ITEM              WEIGHT   V-MOMENT   L-MOMENT     F.S.C
   FUEL OIL           739.0      5,016      5,155-      347
   DIESEL OIL           0.0          0          0         0
   LUBRICATION OIL      0.0          0          0         0
   FRESH WATER        248.0      2,612     15,452       289
   WATER BALLAST    3,368.0      9,411     49,632     8,354
   OTHER TANKS          0.0          0          0         0
   CARGO            1,188.4      6,214     13,531         0
   STORES             216.0      2,311      7,862         0
   LIGHT SHIP       5,846.6     55,669     51,859         0
     T O T A L :   11,606.0     81,233     33,917     8,990

   DISPLACEMENT OF LOADED SHIP =  11,606.0

 T R I M   STATEMENT
   FORWARD DRAFT   =   3.41
   AFT DRAFT       =   6.55
   MEAN DRAFT      =   4.93 M (SUMMER LOAD LINE : 8.98 M)
   MEAN DRAFT      =   4.93 M (SUMMER LOAD LINE : 8.98 M)
```

```
S T A B I L I T Y   STATEMENT

   K.M                = 10.37        MTC   =  19,771.8490
   K.G                =  7.00        LCB   =       2.4218-
   G.M AVAILABLE      =  3.37 M      LCF   =       2.2099-
   F.S.C              =  0.77 M
   CORRECTED G.M      =  2.60 M  (MIN G.M REQUIRED : 0.50 M)
```

36.   An application module for **loading and discharging** accounts for all the containers discharged from and loaded on a ship at the terminal. It also maintains records of progress of ship operations.

Inputs to the module include discharging list, loading list and operations time sheet. The output from the module is the container discharge discrepancy list. Samples of computer screen/report are shown below.

    a.   <u>Container discharge screen</u>

            This captures details of containers discharged.

```
Container Discharged                    03/06/92-1245

VSL/VOY   : OCEAN OSAKA   16/233

CNTR NO   : MOLU 4206253    LANDED/OVER/SHORT   : L
YD LOC    : N50131          CONDITION CODE      :
                            DISCH OVERSIDE ?    : N
```

    b.   <u>Container loaded screen</u>

            This captures details of containers loaded.

```
Container Loaded                        03/06/92-1245

VSL/VOY   : OCEAN OSAKA   16/233

OPTION    =======> 1        CRANE SEQ/BAY   :

1   LOAD BY VESSEL
2   LOAD BY CNTR
3   LOAD BY SEQ/BAY
```

c. Quay crane operations time sheet screen

This captures details of progress of ship operations.

```
┌─────────────────────────────────────────────────────────────┐
│  Quay Crane Operations Time Sheet      04/06/92-0915          │
│                                                               │
│  VSL/VOY    : NOR SUSAN      911-1        CRANE   : 21         │
│  OPRN DATE  : 03/06/92                                         │
│                                                               │
│                             TIME                              │
│        OPTR      OPRN CODE   START   BAY   20F   40F           │
│                                                               │
│    1   SG167     50          2300                             │
│    2             60          2310                             │
│    3             50          2325                             │
│    4             35          2330                             │
│    5             12          2335    09D   10                 │
│    6             12          0005    09D   05                 │
│    7             12          0030    10D         11           │
│    8             12          0100    10D         08           │
│    9             12          0125    11D   08                 │
│   10             12          0155    11D   07                 │
│                                                               │
└─────────────────────────────────────────────────────────────┘
```

d. Discharge discrepancy list

This list highlights containers shortlanded or overlanded.

```
┌─────────────────────────────────────────────────────────────┐
│  Discharge Discrepancy                    04/06/92-1245       │
│                                                               │
│  VSL/VOY   : NOR SUSAN     911-1                               │
│                                                               │
│  CONTAINER SHORTLANDED / OVERLANDED :                         │
│                                                               │
│      CNTR NO          CELL       REMARKS                      │
│                                                               │
│      HLCU 2621927     020582     Shortlanded                  │
│      HLCU 2061969     020582     Overlanded                   │
│                                                               │
└─────────────────────────────────────────────────────────────┘
```

Chapter VII

COMPUTERIZATION OF CONTAINER TERMINAL PERFORMANCE CONTROL

37.   Container terminal performance control involves monitoring and reviewing the performance of all aspects of operations in the terminal to ensure the expensive resources are well utilized and a high service level is achieved. Staff should be kept regularly informed of the performance levels achieved as a feedback on their contributions. Good performance should be recognized in the form of incentive payments to motivate them to even higher levels of performance.

38.   An application module for container terminal performance control will measure and report the utilization of expensive resources and the customer service levels achieved for management review and follow up. Samples of computer screen/report are shown below.

    a.   Container chassis service level

         This report highlights the level of service achieved by the container handling equipment in the mounting and offloading of containers in the yard. The report may be produced on a daily, weekly or monthly basis to meet the needs of the managers.

```
┌──────────────────────────────────────────────────────────────────────┐
│ Container Chassis Service Level for Week Ending 31/05/92               │
│                                                                        │
│               ------  Service Time (Hr)  -------                       │
│ CH Arrived    =<0.5        =<1.0        =<1.5        >1.5      Total     │
│ & Serviced    No    %    No    %    No    %    No    %    No     │
│                                                                        │
│ 10 -  11      557   72   155   20   39    5    28    4     779   │
│                                                                        │
│ 11 -  12      545   66   182   22   52    6    46    5     825   │
│                                                                        │
│ 12 -  13      656   67   215   22   64    7    37    4     972   │
│                                                                        │
│ 13 -  14      576   72   167   21   30    4    26    4     799   │
│                                                                        │
│ 14 -  15      514   64   162   20   62    8    65    7     803   │
│                                                                        │
│ 15 -  16      685   62   266   24   79    7    67    4   1,097   │
│                                                                        │
│  TOTAL      3,533   67 1,147   22  326    6   269    5   5,275   │
└──────────────────────────────────────────────────────────────────────┘
```

b.   Container throughput report

This summarises the volume of containers handled at the terminal for each shipping line/agent.

```
Analysis of Operator's Performance for May 1992    04/06/92

                      IMPORT        EXPORT         TOTAL
OPERATOR              20F    40F    20F    40F     20F      40F

MAERSK                500   1000    901   1230    1401    2230

AMERICAN PRESIDENT    300   1100    232    924     532    2024

EASTASIA MARITIME    1235    624    823    542    2058    1166

MITSUI - OSK         1520    456    535    893    2055    1349

NEPTUNE ORIENT       1302    618   1023    522    2325    1140

NYK                  1202    612    905    342    2107     954
```

c.   Equipment utilization report

This analyses the usage of container handling equipment.

```
Equipment Utilization for May 1992                 04/06/92

Equipment Type : Yard Crane
No of Equipment:  45

                1st Shift   2nd Shift   3rd Shift   Total
Activity Type   HOURS    %  HOURS    %  HOURS    %  HOURS    %

STANDBY           300    3    215    2    650    6   1165    3

SHIP OPRNS       5060   45   6734   60   4950   44  16744   50

YARD OPRNS       5700   51   4052   36   5420   49  15172   45

PREV MAINT         50   .5     79    1    100   .8    229   .7

BREAKDOWN          50   .5     80    1     40   .2    170   .3

TOTAL           11160  100  11160  100  11160  100  33480  100
```

d.   Yard utilization report

This computes the utilization level of yard space in the terminal.

```
Yard Utilization for 03/06/92                         04/06/92

                          GROUND SLOT   AVE STACKING HEIGHT
  BLK   EQPT   20FT  40FT  AVAIL USED   GROSS  NET

  T7    FM     116    43    180    57    1.12   3.54

  T8    FM      84    37     60    44    2.63   3.59

  T9    FM     239    45    144   102    2.28   3.23

  U1    YC     286    67    162   147    2.59   2.86

  U2    YC     164    93    162   108    2.16   3.24

  U4    FM     204    53    246   109    1.26  .2.84

  U5    YC     335   142    240   193    2.58   3.21

  U     SC      10    85    146    64    1.23   2.81

  TOTAL       1437   565
```

e.   Vessels berthed report

This analyses the frequency of berthing and the port stay of the vessels.

```
Vessels Berthed in May 1992                        05/06/92

   VSL          VOY  SHPG LINE TYPE   BTH DATE/TIME FR-TO  MOVES

1 HARI BHUM     48S  RCL       CONVL  T01 25-0010 25-0715   188

2 NED ROUEN     2112 NEDLLOYD  RORO   M19 25-0010 25-2030   214

3 TANAH AIR     40N  NOL       CONVL  T03 25-0345 25-0650    58

4 ANDERS MS     9208 MAERSK    3rd G  K14 25-0635 25-1900   480

5 SHENTON       13W  NYK       FEEDER T01 25-1015 26-0310   649
```

Chapter VIII

IMPLEMENTATION CONSIDERATIONS

39. Information technology is now an essential element in the global economy. The efficient operation of a container terminal also depends on how efficiently it can process large volumes of information. Therefore, the application of information technology to container terminal operations and management is critical to the success of the terminal. This will also include electronic data interchange of information between the terminal and its users.

40. Depending on the size of the terminal, the computer application can range from a simple online data entry and retrieval system to a highly sophisticated computer directed real-time system. There is also a range of computer hardware to match each level of application. For a medium sized terminal, a mix of micro-computers and mini-computers offers sufficient capacity to meet its processing needs. It also allows for the addition of processors in the network to cater for growth. A mainframe computer will only be considered if there is a need for a central depository of corporate data from several mini-computers managing several terminals for centralized administrative functions.

41. Another consideration is the need to protect the investment in the application software being used by the terminal. The software should be written in languages and operating systems that can be ported to a wide range of hardware. This will prevent locking in to a proprietary vendor for the hardware.

42. Finally, the environmental issues with regard to reliability of power supply, quality of telecommunication lines, the availability of hardware and software vendors and the availability of trained computer staff will have an impact on the degree of sophistication and design of the computer application. For instance, if the container terminal is situated in a remote part of a country where the environmental factors are adverse, then a highly reliable and simple design is preferred. On the other hand, if the container terminal is situated close to a big city and it handles a high throughput of containers, then the state-of-the-art application can be recommended.

ANNEX

Abbreviations used in Sample Computer Screens

A/C	Account Number
AGT	Vessel Agent
ATB	Actual Time of Berthing
ATU	Actual Time of Unberthing
AVAIL	Available
BAL	Balance
BTH DFT	Berthing Draft
BTH NO	Berth Number
BTR	Berth Time Required
CAT	Container Category
CH	Chassis
CNTR	Container
CNTR DISC	Discharging Container
CNTR LDG	Loading Container
COND	Container Condition
CRANES ASSGN	Cranes Assigned
DELV DATE	Delivery Date
DELV ORDR	Delivery Order
DELV TIME	Delivery Time
DISC	Discharge
DG	Dangerous Good Container
DISC SEQ	Discharging Sequence
DTE/SHFT	Date/Shift
EAT SEQ	Eating Sequence
EQPT	Equipment
ETB	Estimated Time of Berthing
ETC	Estimated Time of Completion
ETU	Estimated Time of Unberthing
FM	Freight Lifter (Medium)
FR	Flat Rack Container
F.S.C	Free Surface Constant
G.M	Metacentric Height
GP	General Purpose Container
GRP ROSTER	Group Roster
GRT	Gross Registered Tonnage
G.WT	Gross Weight
HGT, HT	Height
INDIV ROSTER	Individual Roster
K.G	Center of Gravity above keel
K.M	Metacenter above Keel

Abbreviations used in Sample Computer Screens (cont.)

LCB	Longitudinal Center of Buoyancy
LCF	Longitudinal Center of Floatation
LCG	Longitudinal Center of Gravity
LDG	Loading
L-MOMENT	Longitudinal Moment
LOA	Vessel Length Overall
MAX GRD LOAD	Maximum Ground Load
MT	Empty Container
OCCP	Occupied
OH, O-HEIGHT	Overheight Container
O-LENGTH	Overlength Container
OP	Container Operator
OPTR	Operator
OPRN CODE	Operation Code
OPRN DATE	Operation Date
OPRNS	Operations
OTH-SP-DTL	Other Special Details
OW, O-WIDTH	Overwidth Container
PDISC	Port of Discharge
P FR	Port From
PLOAD	Port of Loading
PM	Prime Mover
PREV MAINT	Preventive Maintenance
P TO	Port To
RF	Reefer Container
SC	Straddle Carrier
SCHD DATE	Schedule date
SHPG LINE	Shipping Line
SNO	Serial Number
SP DETAILS	Special Details
ST	Container Status
STBD	Starboard
STOW CAT	Stowage Category
SZ	Container Size
TA	Traffic Assistant
UNBTH DFT	Unberthing Draft
V-MOMENT	Vertical Moment
VSL/VOY	Vessel/Voyage
WM FR	Wharf Mark From
WM TO	Wharf Mark To
WC	Weight Class
WT	Weight

Abbreviations used in Sample Computer Screens (cont.)

YC   Yard Crane
YD BLK   Yard Block
YD LOC   Yard Location
YD RANGE ASSGN   Yard Range Assigned