Chapter 4

Improvement Strategy for Administrative and Institutional Regime for Effective Port Development and Management

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4.1 Development of the Port Organization for Future Transport Sector

PSO, a national institution under the Ministry of Road and Transportation, is responsible for overall administration of Iranian commercial ports.
Before mentioning PSO itself, it is considered appropriate to roughly examine the institutional and organizational structure of the Ministry of Road and Transportation under which PSO is assigned to its port administration.

4.1.1 Administrative Power Possessed by Governmental Organization in Charge of Transport

In this section, the roles of the governmental organization in charge of transportation and the administrative power which should be given to the governmental organization are briefly discussed.

(1) Characteristics of Transport Services

General characteristics of transport services are identified as follows.

1) Transport services are indispensable in providing necessities to national citizens and for the domestic and international movement of national citizens. Transport services which are necessary for all national citizens have public characteristics.

2) Transport services have a great influence on the national economy. Proper transport services are vital activities to provide necessary materials and to distribute industrial products.

3) Transport services such as airport, sea-port and international shipping services are inevitable for foreign trade and necessary to maintain relationships with foreign countries. They are important factors in the foreign policy of a country.

4) Some transport services such as sea-port, airport and railway need a great amount of investment. Also, they normally have to conduct continuous technological development in order to maintain their quality from the long term standpoint.

5) In general, transport services are provided by the various types of transport business such as sea-ports, shipping companies, airports, airline companies, railway companies, freight forwarders, warehousing companies, buses and taxis.

(2) Necessity of Governmental Control of Transport Services

Transport services is provided mostly by the private sector in many economically advanced countries in many cases. On the other hand, following roles of public sector is also necessary to provide proper and stable transport services to the national

citizens.

1) Formulation of overall national transport policy

Government should formulate overall national transport policy, long term development plan and implementation plan for national transport sectors. This is because transport services are necessary for national citizens and for the improvement of the national economy and each transport sector will not be able to formulate such an overall policy.

2) Securing reliable and stable transport services assisted by governmental subsidies

In order to satisfy the basic demand of the nation, transport services such as railway or bus services are required even under non-profit making circumstances. In addition, transport services sometimes require a great amount of investment to make balance of account. In these cases, governmental subsidies may be necessary to secure reliable and stable transport services.

3) Maintaining proper level of transport fee and charges

Sometimes transport services such as railway may be provided by monopolistic entities. In these cases, governmental control and guidance are necessary to maintain proper level of transport fee and charges.
Sometimes governmental subsidies may be necessary to maintain payable fee and charge level for the citizens.

4) Securing safety and quality of transport services

There is a possibility that transport business entities ignore safety and quality of transport services because investment for safety and quality may not seem directly linked with profits. In these cases, governmental control and assistance are necessary to secure safety and proper quality of transport services.

5) Coordination of inter-modal transport services

Coordination between different transport modes is important to provide efficient and smooth transport services to the users. Governmental control and intervention is necessary to coordinate inter-modal transport services because each transport sector may not make such coordination.

6) Development of technology concerning transport

Development of technology concerning transport is vital for constant provision of high quality service. This tends to be ignored, however, in the early stages in the pursuit of profit. Therefore, Government may need to promote development of technology by itself, or governmental subsidies may be necessary.

(3) Administrative Competence Possessed by Government

Following are the general concept concerning administrative competence which should be possessed by Iranian government from longterm point of view, which are based on the above mentioned general idea and the observations made during our last site survey.

1) Iranian government intends to promote privatization of the governmental enterprises. In Iran, privatization is considered the major governmental policy. However, as mentioned above, governmental control in transport services is considered still necessary.

2) In Iran, local governments are the local agencies of Government, and actually they have only limited administration competence. Since drastic change of this system cannot be foreseen in near future, "Government" means the central government in this section.

3) The governmental control differs according to the conditions of transport services such as mode of transport service, its service area and other conditions surrounding transport services. In items 4)- 6), possible demarcation of roles between public and private sectors are illustrated.

4) Generally Government should have responsibility for the following items.

a) Formulation of overall national transport policy and development plan and realization of the plan.
b) Development of technology concerning transport

5) Transport infrastructures such as airports, sea-ports, which are matters of national interest and require a great amount of investment, should be constructed and owned by governmental organizations. Services in the airports and sea-ports can be provided by private entities, but the governmental organization should administrate the private entities.

6) Concerning other transport sectors, private entities can construct and possess the infrastructures and facilities and operate them. In this case, following governmental control need to be considered.

a) To provide necessary subsidy to secure reliable and stable transport services
b) To give necessary permissions when changing or establishing certain transport fees or charges to maintain proper levels
c) To make necessary control and intervention to secure safety and proper quality of transport services
d) To make necessary coordination between inter-modal transport services to provide efficient and smooth transport services to the users

4.1.2 Model Organization and Administration Structure of the Ministry of Road and Transportation (MRT)

In this section, the outline of a sample organization and administrative structure are shown for future improvement of MRT. It is generally understood that institutional setup of port administration of a country is normally established through long term experience of the country under its own historical and culture background. Considering the above fact, it seems neither appropriate nor practical to propose detailed alternative system for the country.
In this context, it is considered appropriate to show a kind of model administrative system on the basis of Japanese experience so that the future improvement of the current system could achieved by Iranian government itself.

(1) Administrative Power of the Ministry of Road and Transportation

Iranian transport sector should provide safe and reliable transport services to national citizens and contribute to the promotion of their welfare.
To this end, governmental organization in charge of national transport should be responsible in conducting following assignment.

a) Formulation of national transport policy
b) Drafting of laws and regulations concerning transport
c) Supervision, instruction and promotion of transport businesses
d) Promotion of construction and building of transport infrastructure and facilities
e) Securing of safe transport
f) Compilation of statistics concerning transport
g) Indemnity concerning transport
h) International affairs concerning transport
i) Establishment of technical standards concerning transport
j) Development of technology concerning transport

(2) Outline of Major Transport Sector Administration

Among the above mentioned activities, supervision, instruction and promotion of transport businesses, and promotion of construction and building of transport infrastructure and facilities will become more important items in the future.

1) Supervision, instruction and promotion of transport businesses

(a) Purpose and outline
Transport services have a public character in general. The services are mainly provided by transport industries, though in some cases governmental organizations have to provide them. To provide safe and reliable transport services to national citizens, Government is sometimes required to control the transport business. Following items should be under administration of Government.

a) Licensing of transport business

b) Licensing of transport fee and charge that greatly affects both the national economy and every day life of citizen.
c) Subsidizing and financing construction and building of important transport facility
d) Administration of transport business to realize safe and reliable transport services for promoting consumer benefit
e) Vitalization of transport industry
f) Education, training and certification of seamen and airmen
g) Administration of environmental affairs concerning transport

(b) Objective transport business
Transport businesses listed below are administrated by Government.

a) Railway business
b) Trucking business
c) Road passenger transport business
d) Aviation business
e) Shipping business
f) Freight forwarder
g) Warehousing business
h) Travel agency
i) Ship building industry and ship repair industry
j) Vehicle maintenance business

If some of above transport businesses are conducted by Government, these do not need to be administrated. (At present, railway, aviation and shipping businesses are conducted by Government.)
It is desirable that shipping companies and ship building companies be controlled by the Ministry of Road and Transport in future rather than the Ministry of Commerce which controls them at present because they are closely related with national transport policy.

2) Promotion of construction and building of transport infrastructure and facilities

It is important to construct essential transport infrastructure and facilities according to the national policy. Financing and subsidizing the entities which conduct the construction is also important. The objective transport infrastructure and facilities are listed below.

a) Commercial sea port
b) Airport
c) Road
d) Railway
e) Ship

If the new commercial sea port and railway are to be managed by Government,

necessary infrastructure are normally constructed by Government.
Public roads and airports should be constructed by Government though some of them is constructed by other public organizations such as local governments. (In this case Government can subsidize them).

For infrastructure and facilities where users are limited such as highway and international airport, construction is conducted by other public organizations.
Concerning ship building, it is effective for Government to finance ship building if the ships are integral to the national maritime transport policy.

3) Other Control

In addition to the above mentioned affairs, Government should be engaged in the following administration for;

(a) Commercial port, maritime transport and freight forwarder

a) Licensing of reclamation of public water area, permission of usage
b) Water traffic control
c) Registration and inspection of ships
d) Ship officer certification, issuing seamen book

(b) Road transport

a) Registration and inspection of automobile
b) Vehicle maintenance engineer certification

(c) Railway

a) Inspection of railway infrastructure

(d) Civil aviation

a) Air traffic control
b) Certification of pilots and aircrews
c) Registration of aircraft

(3) Organization

Examples of model organization are illustrated based on Japanese experience for the development of the Iranian organization.

1) Example of Organization Structure (Example No.1)

This example shows the organization structure in which administrative affairs of each section is allocated according to the nature of transport infrastructure.

Under the Minister sections which have the following functions are installed.

(a) Secretariat to the Minister;

a) Budgeting, accounting
b) Management of personnel affairs
c) General coordination of administration and legal affairs
d) Public relations, statistics

(b) Overall transport policy

a) Formulation of comprehensive transport policy
b) Coordination of transport matters in general

(c) Railway transport

a) Formulation of national railway transport policy and formulation of railway development plan
b) Promotion of construction and building of railway transport infrastructure and facilities
c) Supervision, instruction and promotion of railway transport businesses
d) Other matters concerning administration of railway transport

(d) Road transport

a) Formulation of national road transport policy
b) Supervision, instruction and promotion of road transport businesses
c) Other matters concerning administration of road transport

(e) Maritime transport

a) Formulation of national maritime transport policy
b) Supervision, instruction and promotion of maritime businesses
c) Other matters concerning administration of road transport

(f) Air transport

a) Formulation of national (both international and domestic) air transport policy
b) Formulation of airport development plan and promotion of construction and building of airport
c) Management of national airports
d) Supervision, instruction and promotion of air transport businesses
e) Other matters concerning administration of air transport

(g) Commercial port construction and management

a) Formulation of port development plan
b) Promotion and management of port construction

c) Management of national water area and national ports
d) Supervision, instruction of port related entities
e) Other matters concerning administration of commercial port

(h) Road construction and management

a) Formulation of road construction plan
b) Promotion and management of road construction
c) Management of national road
d) Supervision, instruction of construction industry
e) Other matters concerning administration of air transport

(i) Others

Meteorological Agency and other subsidiary organizations

2) Example of Organization Structure (Example No.2)

This example shows the organization structure in which administrative affairs of each section is allocated according to the nature of transport activities.

Under the Minister sections, the following functions are installed.

(a) Secretariat to the Minister

a) Budgeting, accounting
b) Management of personnel affairs
c) General coordination of administration and legal affairs
d) Public relations, statistics

(b) International transport

a) Formulation of international transport policy
b) Formulation of development plan of infrastructure and facilities for international transport
c) Promotion of construction and building of infrastructure and facilities for international transport
d) Supervision, instruction and promotion of international transport businesses
e) Other matters concerning administration of international transport

(c) Domestic passenger transport

a) Formulation of domestic passenger transport policy (except civil aviation)
b) Formulation of development plan of infrastructure and facilities for domestic passenger transport (except civil aviation)
c) Promotion of construction and building of infrastructure and facilities for domestic passenger transport (except civil aviation)

d) Supervision, instruction and promotion of domestic passenger transport businesses (except civil aviation)
e) Other matters concerning administration of domestic passenger transport (except civil aviation)

(d) Domestic cargo transport

a) Formulation of domestic cargo transport policy
b) Formulation of development plan of infrastructure and facilities for domestic cargo transport
c) Promotion of construction and building of infrastructure and facilities for domestic cargo transport
d) Supervision, instruction and promotion of domestic cargo transport businesses
e) Other matters concerning administration of domestic cargo transport

(e) Civil aviation

a) Formulation of domestic air transport policy
b) Formulation of airport development plan and promotion of construction and building of airport
c) Management of national airports
d) Supervision, instruction and promotion of domestic air transport businesses
e) Other matters concerning administration of domestic air transport

(f) Road construction and management

a) Formulation of road construction plan
b) Promotion and management of road construction
c) Management of national road
d) Supervision, instruction of construction industry
e) Other matters concerning administration of air transport

(g) Commercial port construction and management

a) Formulation of port development plan
b) Promotion and management of port construction
c) Management of national water area and national ports
d) Supervision, instruction of port related entities
e) Other matters concerning administration of commercial port

(h) Others

Meteorological Agency and other subsidiary organizations

3) Feature of the Examples

Concerning Example No.1, each section can smoothly control each transport business. On the other hand, the coordination between the different transport modes will be more difficult than in Example No.2.
Concerning Example No.2, the transportation policies of each theme such as international transport, domestic transport can be established more easily. However, the control of the transport businesses will be rather hard.

In general, it is thought that Government should administrate the various types of transport business to control national transport. Therefore, the organization structure shown in Example No.1 is considered recommendable.
As the inter-modal transportation, however, will become vital in the future, it is important to establish appropriate schemes in which Government can smoothly make coordination between the different transport modes. Introduction of a personnel movement system between the section in charge of overall transport policy and other sections which are in charge of each transport mode will be therefore effective.
In each section, introduction of a personnel movement system between the policy making division and the divisions in charge of administration of each business and management of projects is important.

4.2 Basic Policy for Management and Operation of PSO Ports

4.2.1 Required Functions for Iranian Commercial Ports

(1) Major roles of the Iranian ports

1) To be logistics centers to provide necessities of life.

Iran is the largest country in Southwest Asia both in terms of size and population. Major quantity of the imports and exports of Iran are brought through maritime transport. The Iranian commercial ports have to play roles as the logistics centers to provide necessities for national citizens.

2) To support development of the national economy.

To improve Iranian people's standard of living, the development of Iranian national economy is necessary. To this end, the domestic industries should be activated, and increased productivity is vital. Therefore, the ports should be logistics centers to support these industries, providing necessary materials and transporting their products steadily. Furthermore, to raise the competition among these industries, economical, efficient and reliable services are required for the ports.

3) To function as strategic centers in the international transportation network

(a) Hub ports for Persian Gulf countries
Some Iranian ports along the Persian Gulf and Arabian Sea are close to the major shipping service lines such as Far East - Europe. The ports have the potential to be maritime hub centers for the countries of this area.
At present, general cargo is mainly imported through Dubai port (UAE). This condition is not preferable for the national security of Iran. Iranian ports should be hub ports in this area and collect direct cargo of Iran.

(b) To be the gate way ports for land locked countries
Iranian ports along the Persian Gulf and Arabian Sea are expected to function as the gate way ports for land locked countries such as Afghanistan, Turkmenistan and Uzbekistan.
On the other hand, Iranian ports along the Caspian Sea are expected to function as the transit ports in the Persian Gulf for the Caspian Sea side countries such as Azerbaidzhan and Kazakhstan.

For the Iranian ports, it is necessary to provide more efficient, economical and reliable services compared with neighboring ports in order to function as a hub center in the international transportation network. By providing such service, the Iranian ports will acquire more benefits and foreign currency. This contributes in stabilizing the Iranian national economy and the life of the citizens.

(2) Quality Requirement to Iranian Commercial Ports for Successful Achievement of Its Roles

To be logistics centers for the national citizens, to support development of the national economy and to function as strategic centers in the international transportation network, the Iranian ports should become "attractive and profitable ports for users".

It is thought that (1) highly efficient, (2) cost saving, (3) safe and reliable services are priority requirements in becoming an attractive port for users.

The most important function of a port is as a terminal where sea and land transportation meet. Efficiency and safety are thus vital in the transfer of cargo and passenger. For cargo handling, quickness, reliability and cost effectiveness are strongly required.

4.2.2 Basic Policy for Port Management and Operation

Taking the following issues into consideration, smooth and efficient operation and management systems should be introduced to Iranian ports.

(1) Port activity has a great influence on the national economy. Safeguarding the national interest should be the first priority issue concerning port management and operation.

(2) The basic role of ports is normally as a public facility. Port infrastructure and facilities should be basically operated in open use to the public.

(3) Safe and efficient transfer of cargo and passenger is vital. Cargo handling efficiency is strongly required.

(4) Organization of PSO should be improved to realize high efficiency in its management and operation.

(5) PSO should establish a basic policy and plan for proper development and conservation of port area which should be controlled under a policy to realize proper port activity.

4.2.3 Government and PSO (De-Centralization)

PSO can be identified as an independent organization, because

(1) PSO has its own special account,
(2) PSO has the competence to control national water area and a part of land area.

PSO is, however, under strict control of Government and the Parliament, where;

(1) PSO needs permission from the parliament when changing its tariff by more than

30 %.
(2) Government gives PSO subsidies for large scale development work.

In general, ports are important public infrastructures for the national economy. Therefore, it is necessary that ports be under administration of Government to a certain degree.
On the other hand, the intervention of Government should be reduced especially in the field of port operation and investment for efficient port management and operation. Financial system based on economic principles should be established to realize financially sound port management and operation. It is important that PSO becomes financially independent from Government and has the power to decide investments to realize more efficient and financially sound port management and operation. This will contribute to development of the national economy.
Therefore, the ports should be under control of Government to a certain degree, but the ports should become independent in the field of port operation and investment as far as possible.

An example of the relationship between Government and the port management entity (PSO) is given here below.

1) Port management entity (PSO) should be financially independent from Government.
2) Port management entity (PSO) should have power in deciding its tariff.
3) Permission of parliament should decide its yearly budget.
4) Permission of parliament should be needed to decide the laws and regulations concerning its activities.
5) Port management entity (PSO) should have a council which consists of the heads of the authorities concerned as a decision making organization.
6) The head of port management entity (PSO) should be chosen by the above mentioned council.

Proper institutional system should be created referring to the above mentioned example as far as circumstances permit.
Concerning the tariff, in particular, if modification of a part of the tariff is considered to contribute to proper and efficient port operation, such as modification of storage charge as mentioned below, PSO should have the power to implement such a revision according to its own policy.

4.2.4 PSO head office and Port Authorities

The port authorities currently conduct port related activities according to direction of PSO head office. PSO head office strictly controls personnel, budget and procurement affairs of the port authorities.
To provide the port users with higher quality services in the future, it is desirable that each port competes with each other and devises the contents of the port service. This will contribute to development of the national economy by raising the quality

of port services.
Therefore, it is desirable to gradually transfer some of the administrative authority, which PSO head office has currently, to the port authorities as proposed as follows.

(1) Procurement System

PSO should possess basic port infrastructure and facilities including major quay cranes to control the ports properly even after privatization, and PSO will conduct maintenance work of these port infrastructure and facilities.
Iranian ports should be able to repair cargo handling equipment quickly, especially in the case of container cargo handling equipment such as gantry cranes. To become hub ports in this area, it is very important in operating modern container terminals to minimize idling time of cargo handling equipment. More effective procurement activities for spare parts of maintenance works is one of the priority requirement in order to avoid possible delay of cargo handling for highly time conscious container vessels.
It is desirable that each port be able to purchase their necessities such as spare parts for cargo handling equipment through a more simplified procedure. PSO head office should transfer its power concerning procurement procedure and revision of the budget to the port authorities within a certain range possible and appropriate.

(2) Finance

Each port should become a more independent entity to provide the port users with higher quality services in the future. It is desirable that the port authority or the complex of the port authorities become financially more self-supporting to have more power to decide a part of tariff and investment. The port authorities of advanced ports in major countries have this self-supporting accounting system, which provides us with good examples for upgrading Iranian port's system.

(3) Personnel

PSO head office has the power to decide personnel affairs of the port authorities, such as appointment, transfer and promotion at present.
It is desirable that each port be able to evaluate and appoint its own personnel to cope with the particular problems of each port. It is not rational that PSO head office decides all personnel affairs because the procedure usually takes a long time and the system can hardly reflect the actual condition of each port site.

Therefore, each port authority has the power to decide personnel affairs of staffs who are in charge of controlling port site activities.
On the contrary, smooth relationship between PSO head office and port authorities is necessary. In this sense, it is realistic that some posts are appointed by PSO head office as shown here below.

An example of the roles of the PSO head office and the port authorities concerning personnel affairs as shown here below.

1) The Port Director and the Deputy Port Director should be chosen by PSO head office(the Board of Directors).
2) Employment and dismissal of all Port Authority staff who are lower than the above mentioned class is decided by PSO head office.
3) The director of each division should be chosen by the Managing Director of PSO head office.
4) Promotion and movement of Port Authority staff who are lower than the director of each division is decided by each Port Director.
5) Personnel transfer between Port Authorities is decided by PSO head office in consultation with parties concerned.

Proper personnel system should be created referring to the above mentioned example as under careful consideration on the actual situation.
In addition to this, personnel transfer between PSO head office and the port authorities should be promoted. To realize required development of port management and operation, PSO head office and the port authorities should cope with this theme in cooperation with each other. Considering that ports are unique spots where sea transport and land transport meet, expert knowledge on this field is needed to promote appropriate management and operation. All PSO staff should be well versed in actual condition of the ports. They all should be highly qualified and have experience in port management and operation. In this context, persons who have experience of port operation site should be sent to PSO head office accordingly.

(4) Port promotion

As mentioned later, PSO does not conduct conspicuous port promotion activities. PSO should conduct the activities aggressively. Currently PSO head office is supported to make port promotion plan and conducts it. It is desirable, however, that each port competes with one another to heighten the quality of their services. Therefore, port promotion activities should be conducted directly by Port Authorities in future. Abbas Port Authority, Anzali Port Authority and Imam Khomeini Port Authority, in particular, should conduct these activities at an earlier stage, because these ports compete with neighboring ports such as Dubai port.

(5) Construction Work

At present, large scale construction works are planned by PSO head office, detail design and supervision of them are contracted out by PSO head office.[1] In the future, PSO head office should transfer the jobs concerning construction works except planning, budgeting and formulation of design criteria to the port authorities to simplify the procedures. At the ports which need large scale development such as Abbas port and Imam Khomeini port, this transference is more important.

Note(1) Port Authorities can make contracts of construction works.

(6) Operation of the Ports

PSO head office controls port operation activities of each port at present. In the future, PSO head office should transfer the jobs concerning port operation to the port authorities for them to operate their ports more flexibly. Specifically, the issuance of the licenses for cargo handling works to private entities and permission of land use in the port area should be assumed by the port authorities.

(7) Items which should be under control of PSO

While administrative competence should be transferred in some extent to the port authorities as far as possible and practical, PSO must retain control of certain areas, because ports are a strategic and important infrastructure of Iran. Major items of which PSO should be in charge are listed below.

1) Formulation of nation-wide port development policy and plan
2) Examination of development plan of individual port
3) Permission of exclusive use and reclamation of public water area
4) Permission of large scale development activities in port area
5) Establishment of (a part of) port tariff
6) Preparation of budget of Iranian ports
7) Formulation of port related laws and regulations
8) Formulation of technical standards for construction work of ports
9) International affairs

4.2.5 Organization and Personnel

Efficient and safe cargo handling operation is the most important target for PSO. Whole organization of PSO must cooperate to realize this target.

(1) PSO Head Office

PSO head office has the following departments:

1) Finance and Administrative Department: deals with personnel, financial matters.
2) Planning and Project Department: responsible for port development plan.
3) Technical and Engineering Department: conducts construction work and maintenance of port infrastructure and facilities.
4) Operation Department: supervises cargo handling service and other port services.

As far as the organization structure is concerned, no serious problems are observed. However, to cope with the new trends such as privatization, it is desirable to establish new divisions and modernize the functions of existing divisions and departments.

1) Establishment of New Organization

a) Division for Port Promotion

As mentioned before, PSO does not conduct conspicuous port promotion activities, and there is no division in charge of this matter. Port promotion is an important theme for PSO in future. Therefore, an organization specialized for conducting port promotion activities should be established. This organization will be in charge of formulation of port promotion plans, and execution and coordination of the plans.
As mentioned in 4.3.2, this function should be transferred to the port authorities in future.

b) Division for Tariff

PSO does not have a division in charge of formulation of tariff. The division in the Operation Department make drafts of tariff, and the Financial Division compiles them.

In future tariff system has to be changed according to progress of privatization. PSO should obtain sufficient income to maintain a sound financial condition and to make the necessary investments. On the other hand, tariff should be set taking levels of neighboring ports into consideration to attract more port users.
Since setting tariff is important and strategic work, a division specialized for formulation of tariff should be established.
This organization will be in charge of research and formulation of tariff.

3) Section for Environmental Affairs

Environmental affairs has already become an important issue. The establishment of a section which deals with administration of environmental affairs such as monitoring and assessment of environmental impact is considered an urgent requirement.

2) Change of Functions of the existing Organization

According to progress of privatization, following administrative functions will be transferred to private entities.

1) Calculation, billing, collection of cargo handling charge
2) Grievance procedure concerning cargo handling service
3) Management of cargo handling workers
4) Procurement, maintenance and repair of a part of cargo handling equipment.

At the same time, each Department should tackle the new projects listed below.

(a) Finance and Administration Department:

a) Creation of new personnel system towards privatization of cargo handling service.
b) Preparation of financial strategy towards privatization of cargo handling

service.

(b) Planning and Project Department:

a) Formulation of the port policy and plan described in 4.6.
b) Creation of new organization.
c) Development of port statistic system
d) Development of training system.

(c) Operation Department;

a) Supervision of privatization and establishment of proper port terminal management system.
b) Creation of new tariff system.
c) Proper management of port area based on the port policy and plan.

3) Functions to be transferred to the port authorities

a) Construction Work
As mentioned above, PSO head office should transfer the jobs concerning construction works except planning, budgeting and formulation of design criteria to the port authorities to reduce the procedures in the future. This transference is important at Abbas port and Imam Khomeini port authorities where large scale development is necessary.

b) Operation of the Ports
PSO head office should also transfer the jobs concerning port operation to the port authorities for them to operate their ports more flexibly in the future. The jobs which should be transferred are issuing the license for cargo handling works to private entities and permission of land use in the port area.

(2) Port Authority

If cargo handling service is privatized, the sections for cargo verification, cargo handling, warehousing would be separated from the port authorities. Eventually the organization for mooring, water supply, repair work of cargo handling equipment, should also be separated. Towage and pilotage can be separated if there is enough demand.

However, the organization which conducts management of port infrastructure and facilities should be left under Port Authority administration. The following management activities will be done by Port Authorities in such case.

1) Permission of usage of port infrastructure and facilities, berth allotment.
2) Permission of usage of port area.
3) Calculation, billing and collection of usage charges of port infrastructure and facilities.

As mentioned in (1), environmental affairs is an important issue. In the port authorities, the sections in charge of conducting monitoring and assessing environmental impact should be established as soon as possible.

There is a possibility that the port authorities could become financially independent and conduct port promotion activities by themselves in the future. Each port authority should start to study these issues. Abbas port and Imam Khomeini port authorities, in particular, should be able to conduct those activities at an earlier stage, because these ports compete with neighboring ports such as Dubai port.

(3) Container Terminal

At container terminals, uniform operation is normally preferable. Concerning the Iranian container terminals, however, they will be open to plural companies in principle. Therefore, there is a possibility that an organization which centrally controls container operation will be necessary at this terminal.
It may be one solution that a joint corporation is established for this purpose by shipping companies and/or cargo handling companies at ports which have large scale container terminals such as Abbas port and Imam Khomeini port. This company will grasp container yard condition, make the container operation plan, and give directions to cargo handling entities to coordinate in-yard container operations.

4.3 Application of Privatization

In this section, the management and operation of terminals at the major ports along the Persian Gulf and Caspian Sea are discussed.

4.3.1 General

There is no single optimum system for the institution and organization of port terminal management which is agreed upon by all parties concerned. Each country which manages and operates ports has its own management and operation system as seen in the following examples.

(1) In Hong-Kong, the terminals are constructed by private companies that manage and operate the terminals. The port authority only leases the water and a part of land area to the companies.

(2) In Japan, the ports are normally possessed by the public section (usually local governments). They give permission to use terminals to private cargo handling entities. And major container terminals are normally possessed by public corporations which were established to construct and manage such terminals. They lease the terminals to shipping companies which manage and operate them.

(3) At the port of Rotterdam in Holland, the terminals are possessed by the port authority which leases the terminals to private companies by long-term base contract. This system is common at many ports in Europe.

(4) In Singapore, the port authority owns, manages and operates the container terminals. This system is also used in the port of London, England.

In Iran, public institution (PSO) owns the terminals and provides cargo handling services (though they are partly provided by private companies).

4.3.2 Alternative Systems for Port Operation and Management

Alternative systems for port operation and management are developed considering three different aspects as shown below.

(1) Period

1) Urgent
2) Short Term (up to the year 2000)
3) Long Term (up to the year 2010)

(2) Terminals

1) Terminals of the ports of Persian Gulf
2) Terminals of the ports of Caspian Sea

(3) Type of operation and management

1) Whether owner of the terminal will be public sector or not.
2) Whether the terminal will be open use terminal or not.
3) Whether cargo handling operation will be done by private entity or not.

While many alternatives can be conceived logically, seven representative alternatives are selected and arranged as shown in the table 4.4.1.

4.3.3 Basic Policy for Port Management and Operation

(1) Major Issues

Major issues to be taken into consideration in examining management and operation system are listed below.

1) The basic role of ports is normally as a public facility. This concept means that public port should be managed and operated not for limited or specified users but for open public use.

2) Major Iranian ports can be profitable ports if operated appropriately, because they have large hinter-lands. Benefits derived from operation of such a beneficial port should be returned directly to the Iranian economy.

3) Safe and reliable operation is the most vital requirement for transportation sector including maritime transportation sector. In this sense, the Iranian ports are required to provide quick, reliable and economical service to users.

4) One of the most important national policies in this country is privatization which will have a great impact on future port development.

5) Efficient service is often obtained by establishing a competitive environment.

6) Iranian ports have the potential to collect more cargoes. If they continue to provide inefficient cargo handling service, however, present port users shall move elsewhere. The neighboring ports such as Dubai intend to become hub ports of this area. A part of import cargo, general cargo in particular, is transported to Iranian ports through Dubai by feeder service. This seems to result in a great loss for the Iranian national economy. PSO should recognize the fact and take appropriate action to improve the situation.

(2) Policy for Port Management and Operation

Taking the above mentioned issues into consideration, main policies for port management and operation are formulated as follows.

1) Considering the actual situation of Iranian port administration require and

importance of port function in promoting national economy, the terminals of the ports should be owned by the public sector or entities under proper control of Government.

2) In principle, the terminals of the ports should be open use terminals for the public. Under such operation, the terminals may accept all ships of different companies.

3) To improve cargo handling efficiency, cargo handling service should be transferred to the private sector as soon as possible. At the same time, a competitive climate both among the private and PSO ports and expected should be fostered.

4) In the future, there is some shipping companies to collect adequate volume of cargo to manage one exclusive use terminal. At that time, an exclusive use terminal can be opened, in addition to public terminals mentioned above. An exclusive use terminal can normally provide more efficient services.

(3) Conclusion

According to above mentioned policies, Alternative(D) and Alternative(E) in the Table 4.3.3.1 are considered the best selections for PSO.

Under alternative(D) and (E), early introduction of privatization in cargo handling operation is recommended. As is commonly understood, public sector is normally not flexible in providing personnel or investment in response to the actual fluctuation of demand. In this sense, full involvement of port authority in cargo handling services is not always suitable for improvement of efficiency of such services under a competitive market, and increased situation of cargo flow in particular.
Timely privatization of cargo handling function may therefore be desirable for Iranian ports expecting to improve their efficiency through competition among private companies. This will be a better solution to realize an efficient cargo handling system and to contribute to improvement of Iranian economy in the future.
To realize above mentioned introduction of privatization, however, PSO has to make great efforts to attract more cargo so as to activate the port related entities which may absorb PSO's operational staffs.

(4) Port Management Entity

The advanced ports in the world are managed by public sector as shown below.

1) Most major ports of Japan are managed by local governments (municipalities and prefectural government).
2) Major ports of Netherlands, ports of Rotterdam and Amsterdam, are managed by the respective municipality.
3) Port of Hamburg (Germany) is managed by the federal government and the municipality.
4) Major ports of Taiwan, Keelung and Kaohshiung, are managed by Government.
5) Port of Singapore is managed by Government.

Table 4.3.3.1 Alternatives of Terminal Operation

Alternative		Present		Short Term Plan (~ 2000)		Long Term Plan (~ 2010)	
		Major ports on Persian Gulf	Major ports on Caspian Sea	Major ports on Persian Gulf	Major ports on Caspian Sea	Major ports on Persian Gulf	Major ports on Caspian Sea
(A)	Owned by	Public	Public	Public	Public	Public	Public
	Provide service for	Open	Open	Open	Open	Open	Open
	Cargo handled by	Public & Private	Public & Private	Public & Private	Public & Private	Public & Private	Public & Private
(B)	Owned by	Public	Public	Public	Public	Public	Public
	Provide service for	Open	Open	Open	Open	Open	Open
	Cargo handled by	Public & Private	Public & Private	Private	Public & Private	Private	Public & Private
(C)	Owned by	Public	Public	Public	Public	Public	Public
	Provide service for	Open	Open	Open	Open	Open	Open
	Cargo handled by	Public & Private	Public & Private	Private	Public & Private	Private	Private
(D)	Owned by	Public	Public	Public	Public	Public	Public
	Provide service for	Open	Open	Open	Open	Open & Exclusive	Open
	Cargo handled by	Public & Private	Public & Private	Private	Private	Private	Private
(E)	Owned by	Public	Public	Public	Public	Public	Public
	Provide service for	Open	Open	Open & Exclusive	Open	Open & Exclusive	Open
	Cargo handled by	Public & Private	Public & Private	Private	Private	Private	Private
(F)	Owned by	Public	Public	Public	Public	Public, Private	Public
	Provide service for	Open	Open	Open & Exclusive	Open	Open & Exclusive	Open & Exclusive
	Cargo handled by	Public & Private	Public & Private	Private	Private	Private	Private
(G)	Owned by	Public	Public	Public	Public	Public, Private	Public, Private
	Provide service for	Open	Open	Open & Exclusive	Open & Exclusive	Open & Exclusive	Open & Exclusive
	Cargo handled by	Public & Private	Public & Private	Private	Private	Private	Private
(H)	Owned by	Public	Public	Public, Private	Public	Public, Private	Public, Private
	Provide service for	Open	Open	Open & Exclusive	Open & Exclusive	Open & Exclusive	Open & Exclusive
	Cargo handled by	Public & Private	Public & Private	Private	Private	Private	Private

Notes 1 : Exclusive ; The type of operation which allows only limited companies to use berth(s)

Notes 2 : Open & Exclusive ; In principle the berths are open to public use, but exclusive use berths will be partly introduced.

It is considered realistic that Iranian ports be managed by the entities mentioned below in the future.

1) PSO (the port authorities) should manage important ports for the national economy whose hinterlands are not limited to the area just around the ports.
PSO has enough experience and ability to manage such ports. Any merit in transferring such ports to other entities such as local governments can not be expected.

2) In the future, small ports whose hinterlands are limited to around the ports can be managed by other entities such as local governments. PSO should commence a study on this item.

(5) Exclusive Use Terminals

Under the alternative (D) and (E), introduction of the exclusive use terminal system is also recommended in the future in addition to public terminals, because an exclusive use terminal can normally provide more efficient services if appropriately applied as mentioned above.

1) Container Terminal

Container terminals, at Abbas port and Imam Khomeini port in particular, are better suited to the introduction of exclusive use terminal system. In this case, it is very important to determine how to select the best entities for appropriate operation of the terminal. Examples of criteria for selection of such companies are shown as follows.

a) Companies which are able to perform efficient container cargo handling to fit customer demand.
b) Companies which can collect adequate quantity of container cargo while keeping sound financial position.
c) Companies which can provide reliable services throughout their leasing term

2) General Cargo Terminal

General cargo terminals are normally used by various users and handle a smaller amount of cargo compared with container terminals. Naturally, these terminals should be open to public use.

3) Bulk Cargo Terminal

In the case of terminals for bulk cargo such as grain, iron powder and aluminum powder, on-land facilities can be used by a specified entity, while the berth will be used by many shipping companies: Therefore, the berths should be open to public use. PSO may lease limited land area to the specified entities, and allow them to construct on-land cargo handling facilities if these facilities do not obstruct public use of the berths. In this case, the lease periods should be limited.

4) Passenger Terminal

In the case of passenger terminal, PSO will own and manage the berth, and passenger ship will be given priority to use it. One alternative may be a public berth with passenger terminal buildings for exclusive use by particular companies. Furthermore, where a private company is willing to invest, it can be the owner and exclusive user of that passenger terminal building.

(6) Owner of Port Infrastructure and facilities

PSO should own major infrastructure and facilities such as water facilities (waterways, anchorage, and turning basins, etc.), breakwater, wharves, open storage yard and transit sheds even after privatization of cargo handling services.
In addition to these, quay cranes fixed on the berths such as gantry cranes are desirable to be owned by the port management entity not to obstruct public use of the berths. These cranes can be leased to private cargo handling entities in the future. Other equipment such as forklifts and movable cranes may be owned by private entities because this equipment can be flexibly provided by private entities and the port management entity can avoid tiresome procurement procedures and maintenance work. However, items of equipment which PSO owns at present should be retained until their service lives have expired.

4.3.4 Introduction of a competitive environment

Present operation of monopolistic cargo handling service by PSO should be modernized by the year 2000. PSO should encourage private sector to enter into the field of cargo handling service providing an attractive environment for competition. One method is suggested as follows.

PSO will deliberately privatize the cargo handling sections; PSO should give more business opportunities to private companies gradually by concession or other means towards the year 2000.
At the same time, PSO should introduce a system to encourage fair competition among the entities concerned. A system in which a certain company is always appointed to a specified berth or pier is not preferable. Instead, a port user should be able to evaluate the ability of a company and make his selection accordingly.

4.4 Financial System and Tariff Policy for Sound Financial Position

4.4.1 Financial System

(1) General

PSO has a modern financial system as it uses normal financial statements.
However, PSO is not financially independent from Government because its investment budget comes from the national general account.

Generally, the intervention of Government should be moderate especially in the field of port operation and investment for efficient port management and operation as much as possible. Financial system based on economic principles should be established to realize financially sound port management and operation.
It is important that PSO becomes financially independent from Government and has the power to decide investments to realize more efficient and financially sound port management and operation. This will contribute to the development of the national economy.

(2) Development of Financial System to cope with Privatization

If operational personnel is transferred to private sector, personnel expense will be reduced accordingly, but cargo handling revenue will also decrease. Cargo handling is currently the major source of revenue for PSO, so the financial condition will be drastically changed. The other types of revenue such as lease charge may partially cover the loss of such cargo handling revenue.
PSO should make a financial strategy matters to realize sound financial condition to rationalize its optimum management.On the other hand PSO should aggressively invest in construction projects which have the potential to become vital sources of revenue.

4.4.2 Tariff

(1) General

Financial system based on economic principles should be established to realize financially sound port management and operation. PSO should set its tariff at a proper level to obtain sufficient income to maintain sound financial condition and to make the necessary investments.
On the other hand, tariff should be set taking levels of neighboring ports into consideration to attract more port users. PSO should make constant survey and analysis on tariffs of neighboring ports and major hub ports in the world.

(2) Privatization and Tariff

With the introduction of privatization, the income structure will be changed drastically. After privatization, the consignees will pay charges such as cargo handling

charge to the private entities, then the private entities will pay port charge and duties such as charge for transit sheds to PSO (the port authorities).
The consignees will pay the port authorities the port duties such as wharfage.
The shipping companies will pay the port duties such as port entering duties and dockage to the port authorities.
If pilotage, towage and line handling services are privatized, the shipping companies will pay these charges to the private entities.

(3) Important Issues for Setting Tariff

1) Basic Policy for Setting Tariff

The tariff should be set based on the policy explained below.

a) The tariff should be set at a proper level so that the ports can maintain a sound financial condition and make necessary investments. At least, it should be set at a level which income can cover management and operation cost and repayment for interest and principal of loans.
b) Even a port which has high efficiency with port service, cannot attract users if its tariff is at too high level. The tariff should be set at a competitive level taking neighboring ports' tariff into consideration.

2) Calculation of Tariff

Standard procedures for setting the tariff are shown below.

a) Estimate yearly (monthly) demands such as cargo handling volume and tonnage of calling vessels.
b) Set a temporary tariff taking neighboring ports' tariff into consideration and calculate yearly (monthly) income according to above mentioned demands.
c) Check whether the ports can recover operational cost and investment or not.
d) If not, revise the temporary tariff until a balance is achieved.

When setting the tariff, it also should be considered that if cargo handling services are privatized, the ports can reduce personnel costs but cargo handling revenue is transferred to the private entities. The ports need considerable income if they want to become financially independent and make investments by themselves. Therefore, tariff should be set at a appropriate level. It is also considered to set the different tariff levels between ports on Persian Gulf and ones on Caspian Sea.

3) Tariff Structure

Tariff should be set based on the costs. The tariff structure should reflect this principle. Standard tariff structure is shown below.

a) Port entering, for dredging, for lighthouse : /GRT or /GRT/day
b) Dockage : /GRT/day

c) Wharfage : /cargo ton and /TEU
d) Cargo handling duties : /cargo ton and /TEU
e) Cargo handling equipment : / hour

4) Setting of storage charge

At the port sites, long term cargo storage is observed frequently, which causes inefficiency of port operation and wasteful investment for cargo storage facilities such as transit sheds.
In due to improve cargo rotation and realize. The outline of the tariff system to avoid the above inefficient operation is shown below.

a) The storage charge is discounted for short stay (within one or two weeks) cargoes.
b) The storage charge is increased for long stay (exceeds two weeks) cargo accordingly.

At present PSO has already adopted this storage charge system in principle. A more severe penalty ,however , should be imposed on the owners of long term storage cargo.

4.4.3 Procurement System

(1) Necessity of Modernization of Procurement System

Procurement procedure of PSO has gradually improved because a part of the power was transferred to the port authorities. However, this de-centralization did not go far enough as the authorities can not procure large scale equipment. According to our observation, PSO seems to spend much time in concluding procurement procedures. Since it is very important in operating modern ports to minimize idling time of cargo handling equipment, more effective procurement activities for spare parts of maintenance works are required in order to avoid possible delay of cargo handling.

It is desirable that the port authorities be able to purchase spare parts for cargo handling equipment through a more simplified procedure.

4.5 Control of Port Area, Infrastructure and Facilities

4.5.1 General

Port should be properly controlled to provide efficient and reliable operation. To this end, PSO should formulate basic policy for national ports and prepare plan concerning development and conservation of port area. In this policy and plan, basic roles and functions of ports, policy for usage of port area, location and scale of port infrastructure and facilities should be defined. (Hereafter this policy and plan will be referred as to "the port policy and plan".)

Construction work for port development, permission for usage of port infrastructure, facility and area should conform to the port policy and plan.
The port policy and plan should be coordinated among authorities concerned and other related entities including local entities.

4.5.2 Items to be included in the Port Policy and Plan

The port policy and plan are categorized into two levels i.e. national level and individual port level.

(1) National Level

For the national level port policy and plan, following items are mainly defined.

1) Basic role of Iranian commercial ports except oil port
2) Capacity of the ports at target year
3) Functional allotment of each port

(2) Individual Port Level

For the individual port level policy and plan, the following items are normally defined within the frame-work of the national level policy and plan.

1) Capacity of individual port at target year
2) Basic policy for utilization of water area in the port
3) Location and scale of port infrastructure and facilities

Important ports for the national economy, such as major Iranian ports, should have an individual port policy and plan. Considering tight financial conditions of Iran, investment should be allocated preferentially to projects which are included in the policy and plan.

4.5.3 Effect of the Port Policy and Plan

To execute proper port development, port operation and management should be based on the port policy and plan. It is thought expedient to include certain control

mechanisms of port development, port operation and management in the port policy and plan.

(1) Control of Water Area

Water area of port is one of the most important assets for port authorities because ports are the transit point of water and land transportation. If a port authority cannot control port area properly, it will be impossible even to accept ships in its port. Therefore, proper and strict control of water area by port authority is a necessity.
Any kind of exclusive use or activities at the water area should be regulated with permission of port authority. The permission should not be based on arbitrary decisions, but on the port policy and plan.

(2) Control of Land Area

Land areas used for port activities are currently owned by PSO under its exclusive control. But it seems that there is no concrete policy for land use or management of the area which is currently conducted according to case-by-case decision. Any activities in PSO areas need permission based on the port policy and plan.
There is a possibility in future that PSO will control private area beyond the present PSO area for the purpose of proper and smooth port management and operation. In this case it will be better that PSO controls this area to a certain extent including the prohibition of activities which seriously impede the utilization or preservation of the ports.

(3) Construction of Port Infrastructure and Facilities

Infrastructure and facilities for new construction or large scale improvement described in the port policy and plan should be given priority with special allocation of budget.

4.5.4 Regulations for The Port Policy and Plan

(1) Procedure for Formulation of The Port Policy and Plan

The port policy and plan indicates future condition of ports. Furthermore, the port policy and plan controls various kinds of activities in port areas. Therefore, it should be coordinated among authorities concerned. The port policy and plan should be formulated in a proper and fair manner under formal regulation.

Usually, provinces and cities close to the ports have a great interest in the port activities and development. The policy and plan should be also coordinated among them. It is desirable that those port authorities, which demonstrate competence, have the power to formulate drafts of the individual port plans to reflect local interests in the future.

(2) Port Area

In the future, PSO should designate and control all land and water areas which are necessary for proper port activities. This will include not only the PSO area but also private areas. Concerning water area, it should include sufficient turning basin and access water way.
It is needless to say that the above mentioned area should be designated in a proper and fair manner under formal regulation.

(3) Restriction of Activities in Port Areas

In Iran, all entities require permission when carrying out certain activities such as exclusive use of port area. Permission should not be based on arbitrary decisions, but on the port policy and plan.

Chapter 5

Overview of Engineering System

Chapter 5 Overview of Engineering System

5.1 General Background concepts

This subsection deals with the possible engineering system for efficient management and economical port operation on the proposed port activities in respect of the technical aspect, "engineering". The engineer should have responsibilities in various technical activity including, site investigation, planning, design, construction super vision and periodical maintenance. Giving training to young engineers is one of the important duties of senior engineer.

Imam Khomeini port forms an important element in the economic and social development of Iran. Accordingly, port study should not only concern the port itself but also consider the wider economic, social and physical factors in determining the role of the port in the overall regional and national development plans.

Factors that may be involved are, for example:

- space and land requirements;
- economic development of the hinterland of the port;
- port related industrial development;
- existing and expected cargo flows and composition per trade;
- type and size of vessels per trade;
- land and water transport links with the hinterland;
- access to and from the sea;
- physical development potential;
- nautical and hydraulic aspects;
- safety and environmental impact;
- economic and financial analyses;
- existing structures and facilities.

The above list serves in order to illustrate that port study is a complex and multidisciplinary activity. The different aspects or discipline are very much interrelated and no conclusion in one field can be drawn and maintained without taking knowledge of the findings in other fields.

There is a great diversity in sizes, types and functions of ports. For example, coastal ports and river ports, natural tidal harbors and enclosed docks.

In terms of function, there are multi-purpose ports (e.g., general cargo, container, ferry, bulk ports) like Imam Khomeini port, dedicated ports (handling one specific cargo e.g., ore, oil or ro-ro), leisure ports, fishing ports and naval ports, etc.

Many port planning studies as the Master Plan study for Imam Khomeini port does seek to increase the capacity and/or efficiency or existing facilities, prior to start to design new ones. Consideration should always be given to optimization of existing facilities by improved operational control of both port and through transport systems

or by relatively minor improvements/modernization of those facilities. Worldwide experience has often shown that substantial increases in throughput can thus be achieved economically and that major infrastructure improvements can be avoided or postponed.

If the demands cannot be met by optimization it is necessary to consider plans for expansion or development of new facilities within or adjacent to the port.

Port planning will generally start with an economic assessment in order to establish cargo flow forecasts by commodity and origin/destination. Regional and national development studies and, possibly, marketing studies for particular commodities will be required as a basis for the forecasts. Statistics on cargo and ship movements at existing ports are also required.

Then the engineers will commence the required technical studies in physical layout plan, traffic circulation study, cargo handling system analysis together with various alternative studies. Finally, design of facility will be carried out for construction purpose together with the tender documents.

It is important that the manager of engineering group keeps always the various factors as shown in previous list in his or her mind.

5.2 Findings on Current Situation

This subsection deals with the present situation of PSO's engineering system and its preliminary evaluation for better system in the future. PSO has already established its own engineering system that combined system between the private consultants and POS's own engineer groups. They are well coordinated by various communication channels including the technical seminar and open discussions.

However, the present system should be improved for better technical management on the facility construction including the future large project as proposed in the Master Plan.

The Study Team has watched the major Iranian ports during the first site visit since the end of October 1993 and conducted various discussion about the engineering aspects with PSO counterparts and other agencies. Among these major ports, both Anzali port and Imam Khomeini port were selected as the objective ports for further study including preparation of Master Plans and Feasibility Studies, thus a more deep study of them was conducted accordingly.

Through these observation tours and data analysis, the current situations and issues to be solved were grasped and analyzed. It is expected that these data can contribute to better engineering arrangement in the major ports.

Thus, this subsection will provide several ideas in respect of the existing conditions of major ports with regard to the engineering aspects. As mentioned above, two

ports, Anzali port and Imam khomeini port are the main data sources.

5.2.1 Technical Standards

PSO recognized the importance of keeping its own technical standards and tried to prepare them before. However the preparation of them was not completed yet. The consultant employed by PSO is usually select the standards by themself based on characteristics of each project.

Technical standards aim to provide the engineer and the consultant with the minimum requirements in both quality and capacity of facilities and basic design method to be followed, for example.

(1) Design waves for the breakwater design
(2) Safety factors in structure analysis and stability calculation
(3) Standard live loads and surcharge loads to be supported by structures
(4) Standard characteristics of vessels (length, beam, draft, etc.)
(5) Berthing condition of vessels (approaching speed, tug boat assistance, etc.)
(6) Protection measures against steel corrosion (painting, concrete cover, cathodic protection)
(7) Minimum covering concrete to reinforcement
(8) Bearing capacity of pile foundation
(9) Drainage design in relation to rainfall intensity
(10) Others

The engineer will study the data following the design method specified in the standards and prepare design criteria. Each facility or structure will be designed by these design criteria.

If PSO has technical standards for designing it own port facilities, there are various advantages in terms of both safety and economy. The standards might provide the consultant or PSO engineers with the minimum requirement to be considered on technical procedures. PSO can easily communicate on the design progress with the consultant. The consultant will firstly follow the guideline specified in the standards then carry out further study according to his own ideas. If the consultant finds out more suitable technical methods, he can utilize it with proper reasoning.

If there are no technical standards, the engineer should start his works to select the design method for every detail. Of course, the standards can not specify all design methods, however the engineer can save time. In addition, the standards will contribute in designing safe facilities by means of minimum requirement verification.

Another advantage is the uniformity of quality to ensure that the project does not suffer from either over investment not under investment. This is very important in public port development where it necessary to make the maximum use of a limited budget. Another advantage may be found out during auditing the project performance.

In the training of PSO technical personnel, the standards will be one of the useful materials.

Other than the technical standards for port facility design, these are related to the regulations and codes including industrial standards, material standards and testing standards. These codes will contribute to control the quality of works.

Note: For this Port Sector Study, the Study Team recommends for and it was accepted by PSO to adopt the technical standards for port and harbor facilities, which was prepared by the Japanese government in 1991. These standards are complied into a text book of 450 pages. Copies of this text have been submitted by the Study Team to PSO for review.

5.2.2 Statistics and Recording System

PSO has developed various facilities at its ports. From the investigation to the operation, many document and drawings were prepared and utilized. According to past experience a medium scale port project of 50 million US dollars requires 4,000 pages of reports and 1,000 sheets of drawings.

- Site investigation	1,000 pages/ 100 sheets
- Feasibility study	,500 pages/ 100 sheets
- Detailed design	1,000 pages/(500 sheets)
- Tender documents	(1,000 pages)/(500 sheets)
- Contract documents	1,000 pages/(500 sheets)
- Records in construction	,500 pages/(300 sheets)
- As-built drawings	- / 800 sheets
Total to be effective	4,000 pages/1,000 sheets

Even a small scale project of 10 million US dollars, total page of documents and drawings might be 2,000 pages and 300 sheets respectively. Routine maintenance works and rehabilitation works will also require documents and drawings, although quantities are relatively small.

Thus, the first action to be carried out is classification of these data by necessity of recording and required period of storage, or disposal schedule.

Another consideration to be taken into account is both systems of recording and delivery for providing data users with easy access and economical storage of a large amount of documents.

a. In case of wide storage and passive usage of records

Data which will not be utilized actively and required to be recorded less than five years can be sorted as they are. This means they will be disposed automatically after five years.

b. In case of narrow storage and active use of records

Data which will be used very often and required to be recorded for long-term can be contained in the compact disks and micro films for the documents and drawings respectively. It is recommended to specify in the contract that the consultant or contractor shall submit the document so required in the form of compact disks or similar.

The general drawings which might be copied so often for review can be recorded in the computer aid design system (CAD). In near future, this system will be the main method for drafting the drawings. For these applications, it is also recommended to study the basic computer system to be employed commonly in PSO.

5.2.3 Utilization of Previous Data and Information

With PSO's assistance the Study Team was able to collect various data and useful information to preparation of master plans and feasibility studies. However, in course of data collection the Study Team found several points to be improved for effective utilization of existing data.

Technical data and information might be categorized as follows.

(1) Site investigation records
(2) Reports and records of project planning and facility design
(3) Tender documents
(4) Prequlification documents
(5) Records of discussion during the prebid meetings and preconstruction meetings
(6) Records of claims, which were requested by the contractor and its settlement
(7) Records of construction and as-built drawings
(8) Records of the final inspection before issuance of the final completion certificate
(9) Records of routine inspection of facilities
(10) Records of routing maintenance
(11) Records of rehabilitation works and main cause of damages
(12) Records of facility modification and improvements
(13) General technical information (new products, advanced technology, and construction news)
(14) Record of PSO employees training (schedule, program, participants)

All these data are very useful not only engineering view but also management purpose, since they provide the port planners and the engineers with more sound information. Inthese respects, thus they should be reviewed by PSO on various occasion as follows.

(1) Improvement and modification of the existing facilities
(2) Routine maintenance and rehabilitation of the existing facilities
(3) Preparation of design and tender documents for new project
(4) Preparation of common design criteria

(5) Preparation of technical standards
(6) Training of PSO's junior engineers and architects
(7) Improvement of the total technical capability of PSO

Note: Prebid meeting is usually held among the tenderers and the client (PSO) or his engineer at the beginning of tender and the client provides tenderers with general guidance to tender. Preconstruction meeting is for clarification of the problematic aspects including technical specifications and review of plans.

Note: As-built drawings are generally prepared by the contractor (or the engineer) modifying the contract drawings together with additional but major detailed shop drawings. They should show the final plan and facility arrangement as constructed.

PSO conducted its best efforts to maintain these technical data and information. Evidence of this appears in record of the drawings for PSO's major ports including Imam Khomeinin port. More than 1,000 sheet of drawings both of the Four Berth Extension, Ten Berth Extension and Fourteen Berth Extension are available in the shape of micro-film at the PSO head office. On the other hand, it should be noted that there is no general layout indicating the existing situation of Iman Khomeini port.

These records should be disclosed as openly as possible to provide the PSO employees with easy access. This means that, data should be filed and arranged for easy use.

It is not economical to keep all the records for ever, thus priority to each data should be given taking both importance and possible frequency of its reuse into account. Following technical items are normally given by the engineers of higher priority.

(1) Site Investigation Records
(2) Plan and Design Reports
(3) Data indicating the existing condition including as-built drawings and technical specifications

Effective Utilization of Past Records

The engineering records of PSO project in the past contain a variety of useful information. The port planners and engineers who participate in future technical studies can obtain many indications from them.

However, if any information about records is not given to them, utilization of such record will be limited to those who knows the existence of records. Thus, they should be given well-informed easy access to touch the records.

For this purpose, necessary actions should be taken into account as follows.

(1) Name of the section or department to which the researchers will contract for obtaining the records should be published openly.
(2) All available records should be filed in accordance with the specified system.
(3) List of records should be prepared by the responsible section and major contents should periodically be distributed to the engineering sections.
(4) When the implementation of new project is completed, an introductive note of the project should be prepared by the consultant and circulated to the engineering related sections.
(5) It is also recommended to record major topics during the implementation stage and conduct a special technical section about such topics by the consultants employed. To compile these discussions, an annual technical report can be prepared for further review.
(6) Special attention should be paid to the records of site investigation carried out in past. In many cases, these records are still active and can be applicable to the present and future engineering study. Thus, they should be properly filed in order to mitigate the required cost of a new investigation.

5.2.4 Cost Estimation and Tender

PSO has its own basic procedure in the project processing. According to the past experience in the large scale project, PSO (the client) employs the consultant (the engineer) which prepares plan, design and tender documents and supervise the contractors activity and duties under the total management by the client. Participation of the consultant and contractor in the various stage is indicated as below.

The Consultant	Procedure	The Contractor
The Engineer	Plan and design	
The Engineer	Tender document	
The Engineer	Prequalification	Applicants
The Engineer	Tender	Applicants
The Engineer	Contract	Contractor
The Engineer	Construction period	Contractor
The Engineer	Maintenance period	Contractor

The present method employed by PSO is a common one and meets with an international open tender.

Tender system adopted by PSO is the unit-price contract which requires the priced bill of quantities. Tender documents for this type of contract consist of followings.

(1) Contract Forms
(2) General Cayses of contactrms

(3) Particular Clauses of Contract
(4) Technical Specifications
(5) Drawings
(6) Bill of Quantities
(7) Information

After the preparation of Tender documents, the engineer estimates the project cost by taking descriptions of documents into account. The estimate is required for not only the budget preparation but also the base of tender price evaluation submitted by the tenderers.

A large scale port construction project normally contains various kind of works, namely the on-land works and the marine works. Each work has different characteristic thus not only general contractors but also specialized contractors in particular field might join to the contracts. To cope with this aspect, there are two systems regarding project contract.

Case 1 Separate Contract System

In this method, the total project will be divided into several work components for example;

"Contract A"	on-land, Pavement
"Contract B"	on-land, Building
"Contract C"	on-land, Utilities
"Contract D"	Marine, Dredging and reclamation
"Contract E"	Marine, Wharf and seawall

Case 2 One Package Contract System

In this method, all the work components will be integrated into one package.

Selection of the best contract scheme will be decided by PSO based on characteristics of each project. Advantage of "Case 1" is possibility of project participation by various contractors, especially for domestic contractors. The advantage of "Case 2" is easy construction management by PSO in quality and schedule.

In Iran, Plan and Budget Organization (PBO) has the right to notice a unit price list to public organizations including PSO. PBO issued its latest price list in 1991. It covers all fields of on-land constructional activities, for example, pavement, building, utilities and etc. Since it is very complicated to prepare standard price and unit cost, the price list of marine works were excluded from the PBO regulations. Thus PSO should prepare marine work price by themselves.

In case of the one package contract, consisting of both the on-land works and marine works , it is reported that the total cost under a package will be calculated by the following procedure.

- Estimation of on-land construction cost based on PBO rules.
- Estimation of marine construction cost.
- (a) plus (b) thus total construction cost.
- If the marine work portion is enough large in comparison with the on-land construction works, PSO has the right to fix its own target cost.

The basic procedure of project implementation in Iran can be summarized as follows.

Iranian Contractor

1) Design of facilities in PSO
2) Quantities of works in PSO
3) Cost estimation in PSO
   - Ordinary works based on PBO schedule
   - Marine works by the consultants estimation
4) Prequalification of applicants will be made by a cooperative team consisting of PBO and PSO.
5) Tender
6) Negotiation: Final selection of contractor will be made only by PSO.

PSO may introduce external financial sources for implementation of large project in the future. In this case an international open tender may be a condition of loan agreements. The foreign contractor will not submit his tender price based on the PBO price but actual price. In this sense, PSO will be required to prepare its own cost estimation criteria based on the tender experience in the past and advises from the consultants.

An international open tender means participation of foreign contractors for the construction. There are two participants in the PSO contract, namely Iranian contractors and foreign contractors.

Joint venture between Iranian and Foreign Contractor

Tender procedure for this case is the same for the Iranian contractors except following.

1) Foreign contractor should make a joint venture with the Iranian contractors.
2) Foreign contractor should be of the friendly countries to Iran.
3) Iranian contractor in the joint venture should be equally responsible for the contract with foreign contractor.
4) Under this joint venture. Iranian contractor and/or foreign contractor may be subcontracted.

This system may indicate the providing of Iranian contractors with preferable condition to award. Iranian contractors also can obtain advanced technology by cooperating with foreign contractors.

5.2.5 Organization with Respect to Engineering Aspects

During several visits to Iran, the Study Team was kindly allowed by PSO to participate in the PSO technical sessions, one of which was with regard to the balance between the cargo demands and scale of facilities and the other was with respect to the general wave characteristics generating in the Capian Sea and Persian Gulf. Each session was held for two hours during which earnest discussions were held. A group of external economists and an engineering consultant led those meetings and provided PSO personnel with basic ideas and recent topics. Of course all the questions were not always answered, however it was understood by the participants that there were many ways to conduct economic and engineering analyses and that each person had different knowledge, ideas and experiences.

If this session can also introduce the modern technologies, which were developed in other countries, discussions will be more attractive and meaningful.

Another impression of the sessions was that few young personnel participated in the discussion, most of them kept silent. This may imply that the grade of discussions is too sophisticated for young economists and engineers to understand.

The Study Team was also allowed by PSO to visit the construction site of fishing ports near Busher port. According to PSO counterparts, PSO was requested by the central government to watch and evaluate the progress of these two port constructions managed by another governmental agency.

The port basin of both ports was protected by rock-mound breakwaters, however, the port basis of one of them was nearly filled up by fine materials due to siltation. Since the main body of breakwater was seriously damaged, silty sand could easily invade into the port basin through the loosened mound of rocks.

Damage to port basin or channel by siltation has unfortunately occurred at many ports in the past. It is assumed that this type of defect could be minimized by conducting study of siltation together with analyzing occurrences at other ports.

PSO employed the consultants in addition to PSO technical personnel in order to slove various technical problems . This can be justified since PSO should maintain a large number of technical personnel if no consultant was employed.

In order to carry out an appropriate future major port development, PSO's organization with respect to engineering aspects can be improved further. The following suggestions on such improvement are based on the experience of the Study Team working with PSO.

(1) It is recommended to continue the PSO technical sessions. However it might be better to be classified by technical fields and length of experience of participants.
(2) Technology of other countries should be introduced especially the technical analysis by computers. Wave calmness, siltation and ship navigation are most

useful programs.

(3) It is recommended that PSO provide opportunities for young engineers to visit other countries and observe the modern port technology.
(4) Use of consultants should be continued. However PSO head office should have its own technical standards and common design criteria for planning of safety and economical port.
(5) If communication between the departments is enhanced, technical knowledge of PSO personnel will be improved.
(6) If communications between the young engineers and senior engineers is maintained more than present situation, valuable experience can be transferred to the next generation.

Please refer to subsection 2.5 "Engineering System" for more information.

As shown above, improvement of engineering aspects require both efforts in technical matters and human considerations. Various errors in the engineering aspects were caused by different deficiencies in human characteristics, namely;

1) Ignorance, negligence and carelessness
2) Lack of imagination and underestimation of influence
3) Insufficient knowledge and lack of training
4) Organization problems. (Lack of authority in decisions and ability to communicate)
5) Others

Of these fundamental causes, "item a" and "item b" are categorized as the direct reasons of technical deficiencies. Most important capability for preventing the design and construction from these problems is to accomplish not only calculations but also experimental thoughs in various alternatives. Thus, if the engineer can generate enough imagination of possible happenings at a certain condition, more appropriate design can be conducted.

While "item c" and "item d" are indirect reasons, since they may initiate the direct reasons. Thus, it is recommended PSO to conduct further efforts in order to improve human aspects.

5.2.6 General Discussion on Problems at Site

Currently 13 commercial port are managed by PSO, through which various type of cargoes are handled to meet the requirements in the maritime transport network. It is expected that improvement of them will take place in order to cope with the future cargo demands.

The general findings on engineering aspects commonly appeared in PSO's ports can be summarized as below.

(Organization)

1) Organization in technical section

(Data Processing)

2) Utilization of technical data and information
3) Design standards

(Building Process)

4) Application to the actual demands
5) Waterfront facilities
6) Maintenance
7) Environmental consideration
8) Cost estimation and tender

PSO conducts best efforts in order to provide the port users with better circumstances. However, the Study Team found several engineering items which should be improved.

Thus, this chapter deals with possible means for improving the existing engineering system in PSO. Considering the characteristics of analysis, discussions are divided into five sections.

1) Common problem and background information
2) Plan and design phase
3) Implementation phase
4) Operation phase
5) Consideration applicable commonly for all phases
6) Basic system for cargo handling equipment and maintenance system

The first five sections are mainly regarding the fixed structures however the last one focuses on the cargo handling equipment.

Previouse section provided the qualitative results of general observation on the present PSO engineering system. It is estimated that they can be regrouped into three elements, namely "Organization", "Data Processing" and "Building Process". These elements are related to each building process namely, plan/design, implementation and operation.

When these elements are lacking, various problems might occur, for example.

1) Unexpected construction claims
2) Increase of maintenance costs

3) Failure of structures

In regard to above there is little existing data provided by PSO except the general scope of maintenance works. Therefore, the experience of other countries is applied.

This section consider to study the common problems in engineering aspects through a study on structural failure and construction claims. It is expected that the essential matters drawn from these analyses will assist in creating a better system in PSO.

(1) Structural Failures

Structural failures may take place in various forms including structural collapse, loss of safety and unserviceability. Knowledge on this aspect may indicate the priority points which should commonly be improved.

The performance of work activities usually involves a wide variety of resources including manpower, materials, equipment, time, and money. The limitations on integration and control of the resources parameters can bring about a project environment in which it is very difficult to execute work activities effectively, efficiently, and safely. The study in the past experience revealed that the main sources of errors in the building process were technical procedures, management practices, and environmental effects.

The critical problem of structural and construction safety is associated with technical and management errors committed during the construction stage of the building process. These errors were mainly attributed to inadequate coordination and communication procedures between engineers, designers, and contractors. Therefore, the problem of failures is mainly related to deficiencies in checking and inspection procedures and not to the lack of refinement of codes of practice or quality control of materials and work procedures.

Finally, the frequency of structural and construction failures can be reduced by developing consistent techniques for safety assessment and evaluation of construction operations. The techniques should account for quantifying the subjectivity and uncertainty associated with the factors that affect safety of construction operations.

(2) Construction Claims

Construction claims may happen in various phase of construction and will consume time and become costly. These aspects may help to identify the basic problem and its solution.

Fundamental causes of claims can also be used to suggest basic preventive tactics. From such an analysis for the claims studied, preventive tactics were tabulated (see Table 5.2.1). These tactics emphasize the importance of both the owner's and the engineer's roles in project management.

The analysis of claims indicates that the client was too much reliant on "exculpatory contract clauses". These exculpatory clauses mostly deal with utility relocation, in which contractors are allowed excusable delays only until the utility relocation become complete. When contractors are forced to enter into contracts containing such clauses they are inclined to submit claims.

Compensable delays, differing site conditions, and defective contract documents can frequently and severely damage contractors. The clients should devote greater attention to the root causes of these problems, such as inadequate geotechnical information or inadequate efforts applied to the quality assurance/quality control of engineering, drafting, and specification development efforts.

The clients often rely heavily on exculpatory contract clauses, many of which ultimately lead to increased contractor claims. Such clauses deserve a thorough review. Owners may find that it is in their best long-term interests in order to allocate related risks more equitably. Claims can also be prevented by conducting more intensive reviews on plans and specifications and by requiring greater project planning efforts on the part of the contractor. The clients charged with administering construction contracts should give more attention to the systematic documentation and analysis of contractor claims because such lessons tell us that future potential claims will be prevented.

Table 5.2.1 Preventive Tactics Corresponding to Fundamental Cause

Fundamental Cause (1)	Preventive Tactic (2)
Site Investigation	
Inadequate traffic sampling	Increase traffic sampling
Inadequate soil investigation	Increase thoroughness of soil investigation
Inadequate surveying	Increase surveying scope and accuracy
Erroneous as-builts	Increase as-builts verification efforts
Plans and specifications	
Poor design	Consider more alternatives, for example, use cementstabilized back fill for approach slabs
Erroneous specifications	Review plans with contractors in preconstruction meetings
Defective specifications	Discuss potentially problematic specifications in preconstruction meetings
Misapplication of technology	Be careful about the limitations of material and equipment
Contractor performance	
Lack of planning and scheduling	Require that realistic schedules be submitted for approval regularly
Shortcuts	Conduct more frequent field inspections: make inspectors aware of these
Owner performance	
Faulty inspection	Increase diligence and frequency of inspections
	Allocate risk more equitably
Reliance on exculpatory clauses	
Bidding practices	
Unclear bid documents	Discuss scope of work in prebid meetings
Front-end loading	Be aware of abuses and establish objective approach for ascertaining
Change justification accommodating the public	Increase communications with public; make contingency plans
Weather	Discuss weather patterns and effects in prebid meetings

5.3 Required Consideration by Engineering Phase

5.3.1 Plan and Design Phase

Possible improvement of PSO engineering system will be provided in this section. Discussion will be conducted following to the ordinary construction process, namely "the planning and design phase", "implementation phase" and "operation phase". Major contents are taken from both the findings shown in Section 5.2 and general experience indicated in subsection 5.2.6.

Scope of Study

Purpose of this section is to prepare recommendations for improving engineering system during the project preparation, namely the planning and design phase. In order to clarify fundamental issues this section is divided into four sub-sections as shown below.

- Planning stage
- Site Investigation stage
- Design stage
- Tender Documents stage

Planning Stage

(1) Flexibility

One of the important aspects during the planning stage is to provide the plan with flexibility. Flexible arrangements might meet the future requirements with minimum modification of existing facilities. Changes in cargo demands frequently occur due to change in economy and industrial development. Cargo handling system may be changed by means of introduction of new technology. Changes in the transportation mode will also happen.

In the preparation of port layout, flexibility of land use should be maintained as much as possible. One of the solutions is the multi-purpose use, which may accept wide range of utilization. Nobody knows what happens tomorrow, thus more chance to making decision should be given to the new generation if a firm conclusion is not found out.

(2) Future Expansion

Cargo volume through the port generally increases in course of time, thus an expansion of port should be carried out accordingly. One of the serious problems is a limited available land. This typical situation can be seen in Anzali port which is surrounded by the dense downtown area, so that there is no expansion space except area towards the Caspian Sea. In the very early stage of port development, future port yard should be kept or provided with strict regulations to limit land

ownership and land use.

Another problems is limited land access. There are many ports in the world the port capacity of which is restricted by the emerging in-land transport. The port construction should be incorporated with such an inland transport network.

Utilities may govern the port capacity too. Electric power supply is one of the most important back-up system for the port.

(3) Maximum Use of the Existing Facilities

Maximum utilization of the existing facility should be made as much as possible. If there is a new requirement to the port, utilization of the existing facility should be the first consideration. When large live loads are expected to the existing facility, structural stability of it should be evaluated based on the original design report and as-built drawings.

The entire structure has an expected length of life. This basic parameter should be depreciated.

Site Investigation Stage

(1) Review of Previous Investigation Data and Information

The scope of site investigation should be decided carefully in order to meet the purpose. Before conducting the site investigation, it is recommended to review the investigation data and information obtained in the past. Useful information can be obtained from previous survey reports. To this end, site investigation records should be filed for review.

(2) Arrangement of Investigation (Benchmarks, Periodical, Special)

Arrangement of site investigation should be made with necessary assistance of the design engineers who will give more specific requirements. This consideration leads the investigation to more functional efforts which may directly contribute to the selection of the most suitable structures. Testing codes should carefully be selected so that survey results can be used easily in another project.

Benchmarks and coordinates should be checked in topographic survey and soundings. Routine survey such as soundings of the channels and port basins will be required, thus scope of the maintenance dredging areas can be known.

(3) Investigation for Facility Design (Adequate Investigation)

Following survey and investigation will be useful for the design of facilities.

1) Geotechnical investigation

2) Topographic investigation
3) Tide and current observation
4) Wind and wave observation
5) Environmental survey

Moreover, survey works of embedded underground utilities will be useful for excavation and pavement works. For the waterfront facilities, settlement survey will be required when construction is on the soft soil layers.

Design Stage

(1) Review of previous Design Data

At the beginning of the design stage, design criteria should be decided based on both conditions of facility usage and natural circumstance. In this aspect it is recommended to review the previous design report at the same site. Then various available data will be found. This action is very effective in maintaining a consistency of design concept and conditions.

The previous design reports will also provide more useful information through the process of required alternative study from the new structure locating near the existing facility.

(2) Technical Standards for Design and Criteria

It is recommended to keep the technical standards of PSO. The standards will indicate the minimum requirement in both design process and quality of facilities. The design engineers can start their works according to the design method recommended in the standards.

Then the design criteria will be proposed by the engineers. The criteria will be quantitative figures by which actual design calculations will be started. This is one of important occasion for checking the progress of design. The required discussion on the design criteria should be made before further study of design works.

(3) Facility Design

Alternative study should be carried out in the design of major facilities, thus reasons of the best selection could be recorded. In this process, the engineer will be convinced of his best selection.

Alternatives should be evaluated by the various view points as follows;

1) Design technology
2) Suitability to natural conditions
3) Availability of materials
4) Availability of equipment

5) Ease of maintenance
6) Construction aspects
7) Flexibility for modification
8) Environmental aspects
9) Cost aspects
10) Future expansion

These ten points should be given weighted marks and total evaluation marks should be provided for each alternative.

(4) Structural Design

There are two categories of structural design, namely the total stability and the safety of structural elements. The former should be conducted first, then each structural member will be designed. In the port facilities, one of the most dangerous matters is the slope failures, which may happen at the waterfront facilities and dredged slope of channels. For the analysis of this failure, computer program has been developed. Another possible case of failure is settlement of earth by soil consolidation. This can easily be seen at the reclamation yard where soft materials are banked.

Lateral force calculation due to the earth pressure, wave pressures, wind pressures and seismic forces are of the most important design factors.

Another view of design will be carried out by studying the maintenance efforts in the past. General discussion about both concrete and steel materials will be provided as follows.

1) Concrete materials

Prevention of deterioration and damage is more desirable than repair. It begins during design and construction of the structures. Conscientious construction inspection, in particular, can minimize the future maintenance costs.

Quality control of materials to be used and careful attention to construction procedures can improve long term serviceability. Aggregates should be free from chlorides and reinforcing steel should have adequate cover. Concrete with a low permeability such as high strength concrete is desirable, but the mix must be proportioned in order to reduce shrinkage cracking.

Protective coatings applied to piles can control permeability, but the durability of these coatings is questionable in some environments.

Many problems associated with concrete are caused by corrosion of reinforcing steel. Using epoxy coated reinforcing steel can diminish or lighten this problem in many situations. Special care should be taken when handling the bars to preventing damage to the coating. Cut ends and holidays should be touched-up in the field with liquid epoxy.

Precast concrete piles can be damaged during construction. Rough handling or overdriving can result in scars or cracks which allow water to penetrate. Minor deterioration of concrete surfaces may not be significant, but it provides a path for oxygen and moisture to reach the interior of the member where more serious deterioration can occur.

2) Steel materials

The majority of structural steel used for waterfront facility substructures consists of sheetpiles, H-piles and pipe piles with concrete pile caps, or piles driven for supporting a pier. In general, piles in seawater have higher rates of corrosion than those in fresh water. However polluted fresh water can also cause severe corrosion. Three ways of protecting steel are coatings, cathodic protection and concrete jackets.

Coatings. Coatings can prevent steel corrosion by separating the steel from the marine environment. Numerous coatings are available for steel piling, including paint epoxy, bituminous coal-tar materials and plastic shrink-wraps.

Cathodic Protection. Cathodic protection can be used in order to protect steel in seawater. There are two systems of cathodic protection; galvanic anode and impressed current.

Concrete Jackets. Concrete jackets are used to prevent the existing piles from further corrosion. When they installed properly they can be very effective.

The concrete used for jacketing must be in a high quality, relatively impermeable and good bonding characteristics.

(5) Cost estimation

Plan and Budget Organization (PBO) has the right to provide a unit price list to public organizations including PSO. PBO issued its latest price list in 1991. It covers all fields of on-land constructional activities for example, pavements, buildings, utilities etc. However the price list of marine works is excluded from the regulations, since it is very complicated to prepare standard price and unit cost.

It is recommended that PSO has its own estimation method based on the past experience.

Subdivision of cost component into two groups, namely foreign currency and domestic currency may be required in case of obtaining the international and financial aids.

Following cost aspects should be carefully conducted.

1) Escalation clause
2) Contingency
3) Mobilization and demobilization

Tender Documents Stage

Basic contract form adopted by PSO is the unit-price contract. Actual payment will be carried out according to the work quantity performed by the contractor and the agreed unit-price in the contract.

PSO should cooperate with the consultant who may prepare the tender document in order to minimize defective clauses. Special attention should be provided to the following aspects.

1) Description of works
2) Natural conditions
3) Exculpatory clauses
4) Others

5.3.2 Implementation Phase

This section aims to provide preliminary idea for improving engineering system during the project implementation phase. This phase can be divided into two stages, namely tender/contract stage and construction stage.

- Tender and Contract
- Construction

Tender and Contract Stage

Clarification of the tender documents will be conducted during this stage. Various discussions among three parties namely the client the engineer and the contractor (tenderers) will be held in both prebid meetings and preconstruction meetings.

(1) Nature of Works

Maximum efforts permitting the contractors (or tenderers) to know the nature of works should be carried out. In case of the temporary work contract or the maintenance work contract, the scope of works together with working conditions should be clearly noticed. When a stage completion is required, necessary explanation to the contractor (or tenderers) will eliminate misunderstanding in the construction schedule.

If PSO supplies any materials, their specifications should be provided to the contractors including with their delivery schedule and its place.

Environmental aspects during the construction should be emphasized especially for prevention of oil spillage and defects to the fishing industries.

(2) Natural Conditions (climatic conditions)

Data and available information which are useful to the project, should be provided to the contractor (or tenderers) in order to realize the existing situation and to prepare a reasonable tender price with the proposed construction method by them.

The following data and information will be useful.

1) Geotechnical condition
2) Topographic condition
3) Layout of the existing facilities
4) Tide and current data
5) Wind and wave data
6) Environmental data and simulation study of construction impact

The borrow pits and dumping sites for the reclamation work and disposal of excess soil indicated on the map should be provided for the contractor (or tenderers) whenever is necessary.

(3) Discussion of Unclear Tender Documents (Problematic Specification)

Problematic tender documents will cause the unexpected extension of time and costly claims, thus discussion between the contractor and the engineer in such cases should be carried out during both the prebid meetings and preconstruction meetings.

Review of contract(tender) drawings should also be fulfilled by the both parties.

Construction Stage

Both parties should discuss the construction aspects in accordance with the contract documents. The followings are major items to be checked by the engineer in the discussions.

1) Schedule Control

The contractor should submit a realistic schedule as much as possible. In case of significant delay of works, hindered productivity should be improved by the required instructions accordingly.

2) Quality Control and Field Inspections

Quality control should be fulfilled by the contractor's responsibility under the supervision of the engineer.

3) Quick Action of the Engineer Side

When necessary the engineer should provide the contractor with the required instructions within the period indicated in the contract documents. Preparation works

for design modification should be carried out by the engineers as soon as possible, in order to minimize the compensable delays.

4) As-builts Verification

The engineer should inspect the as-builts document prepared by the contractor.

5.3.3 Operation Phase

This section deals with necessary actions which should be taken for maintaining the facilities under operation. One of the major items to be discussed is the scope of reasonable maintenance works. Necessary actions can be divided into two categories, namely the routine works and the rehabilitation works.

- Periodical Maintenance (preventive purpose)
- Rehabilitation Works (corrective purpose)

The former is ordinary inspections together with periodical maintenance works for preventive purpose and the latter is rather large scale inspection and rehabilitation works for corrective purpose. Please refer to section 5.4, similar discussion can be seen about the cargo handling equipment.

Port facilities include the ordinary on-land works such as building and pavement and the marine works such as dredging and waterfront facility. This section will provide necessary actions to be taken for the waterfront facility maintenance, since its damage is costly and takes a long time for repairing and easily disdurbes the current port operation.

Need of Structural Inspections

Waterfront facilities namely wharf and jetties have three elements in respect of ease inspection and repairing.

1) Upper surface of structures (Area A)

This part consists of upper deck surface of concrete slab or similar. Defects of these structures can be easily found and the required cost for repair works is normally within a limited scale.

2) Under surface of structures including dry section of pile foundation. (Area B)

They consist of under surface of the concrete beam and slab and piles above the low water level. Damaged part can be observed only when the inspectors go beneath the deck structures. Inspectors should read carefully the tidal tables to find out the safety observation period. During the inspection, an appropriate lighting facility should be prepared.

3) Submerged parts (Area C)

Piles under the low water level are typical examples. Underwater inspection might be required for them. Underwater members must be inspected to the extent necessary to determine with certainty that their condition has not compromised the structural safety. For achieving that certainty, PSO may have to employ one or more specialized underwater inspection techniques. These techniques may include visual and tactile inspections during periods of low water by wading, diving inspections, remotely operated vehicles and underwater cameras, radar and sonar, sounding equipment, sampling equipment, and other specialized inspection equipment as needed to determine underwater structure and current conditions.

Open structure as wharf often have foundation elements located in water for provided the most economical design. Where these elements are continuously submerged, underwater inspection and management techniques must be used in order to avoid failures.

Underwater inspection is only the first step of investigation. The inspection results must be evaluated by qualified engineers. In many cases, open structures must be evaluated by a multi-disciplinary team including structural, hydraulic, and geotechnical engineers.

Periodical Maintenance Works

(1) Periodical Inspection

Routine inspections of superstructure (Area A and Area B) must be conducted at least every five years and two years for concrete structures and steel structures respectively. It is preferable that PSO has a special section for performing these inspections.

Routine inspections of substructures in water must be also conducted at least every five years. Five years is the maximum interval which is only appropriate for a structure in excellent condition. Structures having underwater members which are partially deteriorated require shorter inspection intervals. The American Association of State Highway and Transportation Officials' (AASHTO) Manual for Maintenance Inspection of Bridges requires that steel substructure elements located in corrosive environments should be inspected at least once in every two years.

(2) Periodical Maintenance

If the routine inspections of structures are conducted properly, the required maintenance works can be minimized.

Maintenance and repair of underwater elements, like underwater inspection, has often been neglected in the past. However, it is being charged as the number of underwater inspections increases.

Almost any repairs that can be accomplished above water can also be made below water also, but the work can be much more expensive and time consuming, and requires the specialized equipment. Therefore it is, the most important element before performing repairs to survey and to understand the causes of the distress. The cause of the damage or deterioration may not always be apparent, and further investigation may be required for determining the cause.

Basic repair method of concrete and steel structures will be given as below.

Repair of Cracks (Concrete)

Cracks in concrete can indicate severe damage has occurred or may lead to severe deterioration, if not repaired. When water enters the cracks, spalling and scaling damage can be accelerated.

Cracks can be repaired with epoxy injections both above and below water. The area around and within the crack should be thoroughly cleaned. A high pressure water blaster is very effective for this cleaning. Then the outside of the crack should be sealed with a hand-applied or trowel-applied epoxy grout and injection ports placed at regular intervals in the epoxy along the crack. After the epoxy seal become hardened, epoxy will be injected through the parts working from one part to the next.

Generally, cracks up to 1/4 inch are filled with epoxy resin. For larger cracks, a fine aggregate is added to the epoxy as a filler.

Repair of Small Voids (Concrete)

Voids caused by spalling, scaling or other distress mechanisms can be repaired by several methods. Common to all these methods is the type of surface preparation required.

1) The area should be cleaned of all marine growth.
2) Loose and broken concrete should be removed to sound material.
3) Missing or reduced reinforcing steel should be restored.
4) The concrete should be restored to at least the original contours.

Quick setting cement mortars have been used for repairing small areas. The material is mixed with fresh water, then is carried by a diver who hand packs the material in place. Epoxy mortar can also be used to patch small voids. A typical mortar consists of one part epoxy binder and one part silica sand. The mixture has the consistency of putty and can be placed by gloved hands or trowels above or below water. One consideration in using this mortar is its relatively short pot life. No more should be mixed that can be immediately used.

Repair of Large Voids (Concrete)

For the repair of large void areas in concrete members, the use of cement and epoxy grouts is generally not economical. Larger voids must be formed and the member recast to the original cross section with concrete placed underwater. Forming methods include conventional wood and steel forms, steel sheeting, and a number of proprietary rigid and flexible forming systems.

Several methods can be used to place concrete underwater. The primary concern in placing concrete below water is how to prevent placed concrete from washout. The unhardened concrete should be kept out of direct contact with the water to the extent possible, and protected against fast flowing water. A number of methods have been developed for accomplishing this purpose. Five methods, tremie concrete, preplaced aggregate, the bottom opening bucket, pumped concrete, and bagged concrete are most commonly used.

Jacketing Piles (Concrete Pile)

Deteriorated concrete piles can be repaired by encasing the pile in concrete; that is, by jacketing. In this method firstly, the pile will be cleaned of marine growth; secondly broken and loose concrete will be removed; then reinforcing steel on the pile will be cleaned to bright metal; if necessary the additional steel will be added; and finally forms will be installed. Conventional wood and steel forms can be used; rigid plastic forms for matching a variety of pile configurations are available; and flexible fabric forms can be sewn to fit most situations.

For repair of minor defects, only a slightly larger forms then the original pile can be used, and the small defects filled with a thin cement or epoxy grout.

Repair of Steel Sections

The repair of steel sections underwater is generally accomplished by encasing the deteriorated section in concrete as described above . Repair of steel sections by bolted or welded replacement underwater is not cost-effective, but it can be done if necessary. Quality control of underwater repair, especially welding, is quite difficult.

(3) Recording and Filing

For any given waterfront structure, the combination of environmental conditions and structure configuration can significantly affect the requirements of the inspection. Those structures which require inspection must be noted on individual inspection and inventory records as well as be compiled in a master inspection list. For each structure requiring routine observation including underwater inspection, the following information should be included as a minimum:

- Type and location of the structure.
- Type and frequency of required inspection.
- Location of members inspected.
- Inspection procedures used.
- Dates of previous inspections.
- Special equipment requirements.
- Findings of the last inspection.
- Follow-up actions taken on findings of the last inspection.

Rehabilitation Works

(1) Heavy Duty Inspection

Certain conditions and events affecting a waterfront structure may require more frequent inspections. These include, but are not limited to the following:

1) Unusual Natural Forces

Structural elements located in heavy current and wave attacks and other waterways with known or suspected scour potential should be inspected after every major event to the extent necessary to ensure structure integrity.

2) Vessel Impact

Submerged waterfront facilities should be also inspected if there is visible damage above water. This should be done in order to determine the extent of damage and to establish the extent of liability of the vessel owner for damages. It is especially important for inspection vessel damages in busy port basin and channels on time so that damages can be attributed to the proper vessel.

3) Unusual Live Loads

Excess live loads than designed can damage superstructure and substructure elements, and accumulations of impact loads on the elements can cause severe damages.

4) Prop Wash From Vessels

Prop wash, i.e., turbulence, which caused by the propellers of vessels, can cause scouring currents and propel coarse-grained bottom materials against substructure elements in a manner of similarity to blast cleaning operations.

5) Evidence of Deterioration or Movement

Many underwater deficiencies become apparent above water only when the distress extends above the waterline or is manifested by lateral movement or settlement. Also waterfront structure should be inspected underwater following significant earthquakes.

6) Adverse Environmental Conditions

Brackish water, polluted water, and water with high concentrations of chemicals may cause rapid and severe deterioration of materials.

(2) Rehabilitation Works

The required grade of repair works will depend on the scale of damage. If it is minor, same type of works will be required for the routine maintenance. Most important aspect against these special problems is how to maintain the stability of structures.

- Heavy scour requires foot protection consisting of rock riprapping.
- Damaged piles will be replaced or strengthened by additional piles

Particular Items in Port Facilities

Port facilities includes various work components, namely;

1) Channel and port basin
2) Breakwater
3) Waterfront facility
4) Pavement
5) Building
6) Utility

Each facility should be provided of a maintenance manual by which the required routine maintenance should be conducted.

Data Arrangement for the Next Project

Experience in the past maintenance works and rehabilitation works should be recorded and considered in the future design works.

(1) Data During the Inspection and Maintenance Works

As discussed in paragraph "Periodical Maintenance Works", data of inspection together with maintenance works should be recorded and filed. Contained information should be utilized in the future project for economical port facilities.

(2) Common Data from the Various Ports

PSO should collect inspection and maintenance data from its ports and compile them into a report as basic guidelines for the better design and maintenance works.

The maintenance manuals can be reviewed in accordance with the experience at the site.

Chapter 6

Other Major Factors Relevant to Successful Port Development

Chapter 6 Other Major Factors Relevant to Successful Port Development

6.1 Function of Port Development Plans

6.1.1 Significance of Port Planning

Planning for port development in particular is absolutely essential because of its unique nature and surroundings indicated as follows.

(1) The construction of ports normally requires a large investment of funds over a very long time span because it must often be conducted under complicated and harsh natural conditions. Systematic provision of right amount of facilities is, therefore, the most important requirement for reasonable realization of a port development project.

(2) Ports have close relation to the regional, national and international economic activities. In this respect, it is essential that port services be offered under careful planning so that they can support these activities and generate overall prosperity.

(3) Ports can not play their roles without proper connection with inland transport facilities such as roads and rail ways. This implies that the systematic development of such facilities can not be realized under absence of a comprehensive port plan.

(4) Ports are always requested to fulfill many requirements from various parties concerned including local residents, port users, as well as representatives of economic, industrial and administrative organizations. Port planning process is indispensable in exchanging views and opinions with these parties so that their opinions can fairly be reflected and incorporated in the port development plan.

(5) It is almost impossible for a port management body to conduct proper port operation and management activities without definite port plan which can provide them with specific guidelines for such essential activities.

6.1.2 Types of Port Plans

As already known by port planners, the type of port plan varies widely according to its object, time or geographical coverage, and planning body.

With respect to geographic or target wise category of port plan, it is divided generally into two types. One is a national port plan and the other is an individual port plan. A national port plan covers an entire system of ports located in a country, while an individual port plan covers affairs of a particular single port. Falling between the above two port plans, a regional level port plan is also considered useful under certain circumstances.

As for the time coverage of a port plan, there are many choices from short-term to long-term. In an actual port plan, 5-7 years is normally selected as short-term and 10-20 years for long-term plan in which a master plan is generally categorized.

Since a master plan is considered to cover overall port development, the schemes proposed in a master plan do not always have to be completed in the early stages of port development. Some components of the plan may be discarded or often modified under situational changes. In this sense, the master plan should be something flexible so that it can follow the actual needs of the public or port users by modifying its component.

The short-term plan, of which target year is normally 5 to 7 years (though sometimes as long as 10 years), covers a required scheme or program to be a base of actual execution. The scheme or program indicated in the short-term plan should therefore be supported by more reliable demand forecasts and firmer requirement of port users than those for the master plan. In other words, the component of short-term plan is a priority part of the master plan selected from a practical point of view, and thus more detailed analysis on various key factors such as effects of development, execution system, financial soundness, and environmental impacts should be conducted through the course of planning process.

In respect to the actual component of the Study, the first target of this report (National Port Development and Management Strategy) is in the category of long-term national port plan, and the Master Plans for Bandar Emam Homeini and Bandar Anzali are identified as long-term individual port plans, and Feasibility Studies for these two ports are short-term individual port plans.

Needless to say, the coverage or contents required for each type of port plan also varies in details according to objectives of the plan. Since the core objective of Nationwide Port Development and Management Strategy illustrated in this report is to propose, on a long-term basis, a general port development strategy with appropriate management system able to support the proposed direction of port development, the report does not cover detailed physical planning for each individual port and therefore no explicit cost estimates are included.

On the other hand, the Master Plans and Feasibility Study for Bandar Emam Homeini and Bandar Anzali, which are categorized in long and short-term individual port plans, will include physical planning of required port facilities and equipment together with approximate cost estimates of the schemes proposed, while accuracy of the cost estimate varies according to their time spans and level of available engineering data and information.

6.1.3 Objectives and Requirements of Port Plans

(Long-term National Port Plan: Master Plan for National Ports)
On the basis of the definition illustrated in the above paragraph, the objectives of a long-term national port plan (master plan) can be summarized as follows.

(1) To support overall national socioeconomic development through provision of well coordinated plan of port network and its administration system.

(2) To promote harmonized development of total transport or distribution system of a nation.
(3) To be a base or guideline of individual port plan
(4) To guide port users, investors, and other business entities concerned by presenting a long-term government policy of port development.
(5) To promote better international understanding on the national port development policy and thus attract foreign investment to the country.
(6) To be a base for long-term consideration of various financing agencies in their investment or financial assistance plan.

In accordance with the above objectives, the national port plan (master plan) nodally includes the following items.

(1) Basic strategy and concept of port development
(2) Future outlook of port-related demands
(3) General estimation of national sea-borne and land traffic
(4) Cargo demand forecast on site in port areas
(5) Functional allotment and nationwide location plan of ports
(6) Necessary port facilities and guidelines for development
(7) Basic policy on environmental protection and safety measures
(8) Nationwide port administration and management system
(9) Direction of port-related data system and technical development
(10) Outline of scale of outlay
(11) Other items necessary for effective utilization of the plan

(Long-term Individual Port Plan: Master Plan for Individual Port) The objectives of master plan for an individual port are summarized as follows.
(1) To be a guideline of long-term investment and operational improvement scheme for the target port.
(2) To be a base for short-term development plan of which contents are required to be consistent with total development scheme.
(3) to provide port users, investors, and other business entities concerned with future prospect of business environment and thus to guide the business behavior of private sector in proper direction consistent with the port development.
(4) To promote harmonized development of other infrastructures necessary to realize the proposed port development scheme
(5) To be a component of national port plan so that the future development of the target port can appropriately be coordinated with the overall concept of national port development.
(6) To be a base for consideration of various financing agencies in their investment or financial assistance plan.

In view of the above objectives, the individual port master plan is required to include the following items.
(1) Estimation of future sea-borne and land traffic
(2) Demand forecast on sites in target port area

(3) Estimation of required facilities and layout plan
(4) Land utilization plan for port related infrastructure and industry
(5) Environmental protection measures, if necessary
(6) Port administration, management and operation system plan
(7) Overall cost estimate
(8) Plans for particular items for the target port

(Short-term Individual Port Plan: Feasibility Study for Individual Port)
The objectives of short-term individual port plan are identified as follows.
(1) To be an initial component of the master plan
(2) To provide executing agency with a concrete development plan of the target port for actual implementation of the project
(3) To be a firm base of financing or budgetary arrangement for the port
(4) To be a guideline for detailed design of necessary facilities and for engineering survey required for actual construction works
(5) To be a base for establishment of implementation system including organizational, institutional, and procurement system and work force arrangement
(6) To be a base for compensative policy and environmental counter measure, if required

To fulfill the above objectives, short-term individual port plan needs to include;
(1) Development policy of the port
(2) Detailed proposal for development schemes including layout plan of necessary port facilities and equipment
(3) Engineering study and preliminary design
(4) Cost estimate of proposed facilities to be developed
(5) General evaluation of development of the project
(6) Economic analysis for evaluation of economic feasibility of the project
(7) Financial analysis for evaluation of financial viability of the project
(8) Management and operation system for successful implementation of the project
(9) Initial environmental assessment
(10) Other planning items and considerations particular to the target port

6.1.4 Essential Requirements to the Functional Position of Master Plan

In order to secure applicability and practicability of the master plan, the following requirements of its functional position should be considered by planners or planning bodies.
(1) Time span of the plan should correspond to other long-term national or regional economic development plans, if any.
(2) The plan should be flexible enough to adjust to possible future contingencies.
(3) The plan should, if possible, be vested with a certain legal power or be authorized by the government to promote its development scheme.
(4) Easy access to the contents of the plan should be secured for the interested parties concerned.

It is fair to say that the national or individual port plans, if carefully prepared and appropriately utilized under the above concept, will surely be useful in promoting better quality of life for the citizen of a nation through effective port development proposed in the plans. In this respect, it is considered essential that appropriate authorization of the plan and its active utilization by the government should be promoted through the utmost efforts of the agencies concerned.

6.2 Promotion of Regional Development

Country development is the assembly of regional development and the port development is the most important aspect of regional development. Port development has a great significance in promoting the regional development of a nation, both at the national and the regional levels, particularly in developing countries.

The promotion of international trade is likely to be one of the major determinants of national development. Since ports play the major role as gateways for international trade, it is vital to improve and develop port facilities with a long term perspective so that they do not become a bottleneck to trade promotion.

Additionally, most countries are now confronted with the rapid progress of maritime transport innovation epitomized by containerization, leading to the need for the modernization of their port facilities.

Ports are not necessarily limited to the role of transport, as mentioned above. Increasingly important is the role of port development in the regional development process, with ports functioning as the catalyst for urban and industrial growth. Ports have a lot of inherent advantages in terms of industrial location.

Furthermore, a port can become the core of a growth pole and serve as the catalyst of various types of growth, producing wide beneficial effects over entire regions. Particularly in the form of a port industry complex, when port and industrial development are deliberately and carefully planned together, port development can serve as the center of regional and national economic growth.

A country that depends on foreign trade has to import almost all of basic raw materials and ,in turn, export manufactured goods to the rest of the world for the balance of payments.

Therefore important role of the port is to push forward regional development.

Iran has to export oil and non-oil goods, and import foods, and materials for manufacturing. The port area has the best potential for the manufacturer handling such goods or materials for the following reasons.

- heavy cargo for the project can be handled easily
- Alternative transport modes is available for manufacturing products
- flat land is ready for use

- substantial cost saving can be expected

There are many reasons to construct the new industrial, commercial urban complex for the well balanced national development.

6.3 Employment and Training Policy of Administrative and Operational Staff

6.3.1 Training System

(1) Training System for Administrative Staff

Concerning training system, PSO sends its office workers to universities and institutes, where they take courses related to their work. PSO does not have its own training course for administrative staffs.
In future, PSO needs to develop its own training courses. The core purpose of the courses is
1) to give their full knowledge at understanding both on technological and functional requirements of the ports, and on this
2) basis to change the mentality of PSO administrative staffs to cope with promoting efficiency of port management and operation. This type of training has not yet been introduced. The themes of the training should be as follows.

(a) To change mentality of PSO administrative staffs from "strict supervisors of public port" to "aggressive businessmen and salesmen providing good service to port users".

(b) To make PSO administrative staffs recognize that all PSO staffs must contribute to improve efficiency of port activities to survive competition with rival ports.

(c) To make PSO administrative staff recognize cost-consciousness.

It is practical to teach each staff the needed knowledge for their actual work according to job types and ranks. These courses should include PSO's total function and policy to make the trainee know the purpose of their works and their position and function in the PSO.
These courses should be compulsory for all office workers. Employees should be made to pass these courses as a prerequisite for promotion.

(2) Training system for Operational Employees

The operational employees of PSO will be transferred to private sector is the results of future privatization of cargo handling services. It will be important to further improve their technical ability to cope with modernized container handling operation. PSO should examine the training system for operational employees to develop their ability to perform more quick and reliable cargo handling.
In the future, after privatization of cargo handling service, it will be effective to

establish a public training center for port operational personnel to maintain and raise their competency. A model curriculums for this center are shown below.

1) Operation of cranes and lifts
   (a) Operation of forklifts
   (b) Operation of straddle carrier
   (c) Operation of gantry crane
   (d) Operation of other cranes
   (e) Operation of tractor

2) Cargo handling operation
   (a) Stevedoring
   (b) Slinging

3) Operation of information system for port operation

6.3.2 Personnel Evaluation System and Personnel Movement

(1) Personnel Evaluation System

It is thought necessary to raise morale of port authorities' staff and to promote their ability to discharge duties for proper port management. To realize this it is important to improve personnel management system.

One solution may be the introduction of a modern personnel evaluation system by which PSO staff can be objectively evaluated. Proper promotion and transfer of PSO personnel based on ability and actual perforemance of each staff will be possible by the system.
Introducing a staff evaluation report system is one of effective means. This system should be introduced as soon as possible. When introducing and designing this report, following items should be taken into consideration for objective evaluation.

(a) Evaluation items should be objective as much as possible.
(b) Various staff evaluation reports should be carefully designed corresponding with the type of job and rank.
(c) Certain fixed evaluation period should be adopted.

Contribution to improvement of port management should be counted in evaluating staff performance. Whether a person made any proposal to develop the management system, as well as working efficiency should be included in the evaluation items.
Based on the evaluation, proper measures should be taken such as sending a person to proper training courses, or having his superior give him the necessary guidance.

(2) Personnel Transfer System and Working Condition

A well designed promotion system will provide incentives for personnel and will greatly contribute to developing overall quality of PSO organization.

It will become more important to appoint the right person to the right place for PSO to cope with new structural changes such as privatization of cargo handling service. The above mentioned staff evaluation report system will be very useful in this respect. If a person is evaluated as being highly competent, he should be promoted to a certain level. This promotion system will raise morale of the staff and develop overall quality of PSO organization.

To raise morale of the staff, it is desirable that PSO keeps proper working conditions for the staff including satisfactory salary levels. One solution is to establish a neutral organization which examines working conditions of private companies and makes recommendations concerning PSO staff's working conditions.

6.4 Port Promotion

6.4.1 Necessity of Port Promotion

PSO does not conduct conspicuous port promotion activities, and there is no department in charge of this matter. This is based on the idea that PSO does not need to conduct port promotion because the port is a public sector.
The Iranian ports should contribute to development of the Iranian national economy by attracting more customers and becoming hub ports in this area. Therefore, port promotion activities are vital.

The PSO staffs should become aggressive salesman, and approach all companies which might possibly bring cargo to the Iranian ports in future.
Since the current cargo handling efficiency is not sufficient, PSO's position for sales activities is considered not realistic. But it is recommendable that port promotion be aggressively performed. They should recognize that even if the capacity is small, there will be a chance to attract shipping companies by appealing to the total merit of the port.

6.4.2 Port Promotion Strategy

For performing port promotion activities, it is effective to concentrate on main targets and to make strategies to attack the targets. This strategy should be established as soon as possible.
PSO should take aim at transhipment cargo for the Persian Sea area in particular, and make sales calls at the shipping companies and shippers which carry the transhipment cargo. In this case, sales point should be focused on not only on the port facilities but on the merit of using Iranian ports for the companies.
An attractive brochure is necessary for this purpose. In this brochure, merits of Iranian ports should be described plainly. It should be well designed so that everyone wants to take a look.
Holding seminars to introduce Iranian ports to shippers of various countries is thought also effective.

6.5 Statistic and Recording System for Port Planning and Administration

In the port policy and plan, capacity of ports in the target year is an important issue. To estimate the capacity, present cargo turnover needs to be analyzed. To formulate physical plan and management plan of port infrastructure and facilities of each port, it is important to examine present situation concerning usage of port infrastructure and facilities. Present database, however, is not sufficient for above mentioned requirement. Major database which should be prepared in future is listed below.

(1) Commodity-wise cargo volume arranged by destination and origin (for demand forecast)
(2) Cargo handling efficiency (for planning of port infrastructure and facilities)
(3) Dimensions of calling vessels (for planning of water facilities, mooring facilities)
(4) Condition of usage of cargo handling and storage facilities (for planning of each facilities)
(5) Number of passengers (for planning of passenger facilities)
(6) Traffic volume of roads around port (for planning of port transport facilities)

It is necessary to improve data collection and statistic system for proper port development and management. This can be realized simply by improving office work system. PSO central office should be responsible for improving the above mentioned system including unification of data format.
On the other hand, to formulate port promotion strategy, analysis of cargo turnover is also necessary. Present port statistics, however, are not sufficient to analyze the actual condition as mentioned above.

It is also necessary to provide easy access to port information for port users. This service will make the ports more attractive. Proper information service is mandatory to survive competition with rival ports.
It is necessary to improve the data collection system and statistic system to support formulation of the strategy and proper information provision. Iranian ports will be able to catch up with rival ports by implementing these systems.

6.6 Introduction of Information System to Port Management and Operation

Introduction of information system is an effective means to improve port terminal operation. The systems for container terminal operation, in particular, are indispensable for advanced ports. It is no exaggeration to say that the systems decide the efficiency of the terminal. In this section we will focus mainly on the information system for container terminal operation.

6.6.1 Necessity of Information System for Container Terminal Operation

Container terminal operation can sometimes be conducted without a computer system. In fact, at some terminals, container operations are effectively conducted using the magnet board or cards. But, when the number of containers increases and exceeds a certain level of handling activity, delay and mistakes in handling works usually

increase. Generally, it is said that 60 thousand TEU per year is the limit of manual processing of yard operation control. Even if container cargo volume is under this limit, the systems should be introduced to provide more accurate and more efficient container handling services.
Since, Iranian container terminals donot have any system to make the container loading plans, the such case shipping agencies provide them. At terminals of the advanced ports including Dubai, the terminal operators usually provide the ships loading sequence and stowage plans by using the computerized information system. To provide attractive services for customers, introduction of the systems is important especially at Abbas port and Imam Khomeini port.

6.6.2 Merit of Information System for Container Terminal Operation

The merits of introducing an information system to container terminal operation are considered as follows:

(1) An optimum yard operation plan can be developed. Yard operation can be conducted more quickly and more accurately.

(2) Utilization of container yard can be rationalized

(3) Various kinds of information including container location for safe container storage can be obtained more easily.

These merits greatly contribute to upgrading quality of service to the terminal users.

6.6.3 Outline of Information System to be Introduced for Container Terminal Operation

At the container terminal of Shahid Rajaee port, a simple system for container inventory management has been introduced. This system consists of minimum data file of container and its location (container number, B/L number, name of a ship to be loaded, name of agency company, its location number (address)). In addition, a basic communication system to connect yard site and the control room has been also introduced.

Abbas port should introduce a higher level system which can make a container unloading and loading sequence and a stowage plan. And, on-line communication systems which connect the control room and terminal gates should also be introduced to realize smoother container delivery.
This system should be designed by taking into consideration that this terminal will be used by plural private companies.

The above mentioned systems should also be introduced to Imam Khomeini port which has another container terminal.

In the future, there is a possibility that Iranian ports will have exclusive use terminals. A more efficient system would be introduced by private companies. In

addition to container operation system mentioned above, stowage plan system which has data transmission system and can transmit the work instructions to the yard handling machines, i.e. transfer cranes by the displays on the machines should be introduced.

6.6.4 Other Systems

PSO is introducing many office management systems, such as on-line statistics system, personnel management system.
In the future, on-line system connecting the port authority offices and shipping agencies to exchange information of cargo and ships.
Furthermore, PSO should be a leader in introducing the EDI system linking neighboring ports.
PSO should also push the customs offices to introduce the customs clearance information system to rationalize its procedure.

In conclusion we would like to stress the following points for successful introduction of information system.

(1) It should be recognized that detailed examination by system engineers and other proper staff is necessary to design the above mentioned systems.

(2) When introducing the above mentioned systems, the working systems related to the information systems should be changed. The working systems should be adjusted to the information systems.

6.7 Further Actions Required for Establishing Effective Port Network

Iranian ports mainly handle bulky commodities with some handling capacity of general cargoes in the form of containers and Ro-Ros. It is very likely that if transport systems are not modernized, a large part of the international container transport will move to other ports which are connected with major international ports along the Persian Gulf.

Iranian ports needs to be modernized of their transport systems if they wish to be included in the international network for new demands.

Requirements of the foreign trade for transport and distribution are important to expand and renew the network. It is necessary to make the capacity of the port network flexible enough to cope with possible uncertainty in cargo traffic demand including land bridge flow and the cases of congested cargo ships.

Total port network consists of;

- international port network
- coastal network in Iranian ports, in Persian Gulf and Caspian Sea
- inter modal transport network

It is a most important matter to create the most efficient port network to fit the overall future national requirement. As far as knowledge of port facilities and port capacity are concerned PSO has shown states factory performance.

However, cargo handling efficiency (speed and security) still need to be improved, and reliability of delivery time and frequency of services become more importance from now on.

Considering the above mentioned situation of ports as mentioned above we think the inter modal transportation can perform an important role in a wide country such as Iran and in the stage of transhipment cargo by land bridge.