항만 유형별 정보시스템

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Port Information System For Port Authority

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요 약

항만정보시스템의 기능과 항만유형과는 관련성이 있는 것일까? 본 연구에서는 선진항만들의 유형과 정보시스템 기능 분석을 통하여 관련성을 규명하고자 하였다. 항만들은 자산의 소유와 운영의 주체에 따라 국유제, 공영자치제, 지방자치제(지방정부자치제) 및 사유제의 4가지로 유형으로 구분된다. 유형에 따른 항만들의 주요 활동도 달라진다. 국유제와 지방자치제의 경우는 행정처리 기능에 중점을 두고 있는 반면, 공영자치제와 사유제는 고객서비스 강화에 중점을 두고 있다. 항만의 유형과 정보시스템과의 상관관계를 조사한 결과 국유제, 지방자치제 항만에는 업무처리 중심의 시스템이 발달하여 있으며, 사유제 및 공영자치제 항만에는 고객서비스를 최우선으로하는 커뮤니티 시스템과 e-Business 시스템이 발달되어 있었다. 항만유형별 정보시스템의 차이는 부산항만정보시스템의 개선에 시사점을 던져주고 있다. 그동안 국유제 항만으로서 운영되던 부산항이 공영자치제 유형의 운영방식으로 변경됨에 따라 항만정보시스템도 추세에 따라 개선되어야 한다. 본 연구에서 제안하는 방법으로 3단계 방법을 제안하였다. 제 1단계가 미러링(Mirroring) 단계로서 항만운영을 안정화시키는 단계이며, 제 2단계에서는 커뮤니티 시스템을 구축하여 고객의 서비스를 제고시키는 협업화 단계로 설정하였으며, 제 3단계는 부가가치창출을 위한 수익형 시스템을 개발하는 e-Business 개발단계로 설정하였다.

ABSTRACT

Is there any relationship between a port information system and a port type? This paper aims to define its relationship through a study on the port types of advanced countries and their information systems. In terms of port ownership and its governing body, the port type can be divided into 4 types: state-run, public corporation, local government-run, and private ownership.

According to the port type, the major activities of ports are different. In the case of a state-run and local government-run port, they put emphasis on the function of administration, but a public corporation and private ownership stress the importance of customer services. The study results of the mutual relationship of a port type and an information system show that the state-run and local government-run ports have a good administration-oriented system, and public corporation and privatized ports have an excellent customer-oriented community system and e-business system.

The differences in the information system by port type provide an important suggestion to the improvement of information system of Busan Port Authority. As Busan port has been transformed from a state-run type to a public corporation, a new port information system has to be followed.

Accordingly, this study has suggested a three-stage development plan: The first is a mirroring stage of stabilizing the port management, the second is a cooperation stage of enhancing customer services through the establishment of a community system, and the third is an e-business stage of developing a profit system in order to create value added.

Keyword

Port Authority, Port Information System, Port Management Type

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Ⅰ. Introduction

In an effort to expand the synergy effect among port community, many ports of advanced countries continue to develop their port information systems. PACE (Port Automated Cargo Environment) of London port, PORTNET of Singapore, DAKOSY (Daten Kommunikations System GmbH) of Hamburg, Germany, and INTIS (International Transport Information System) are the typical systems among many ports.

In the case of Busan port, BPA (Busan Port Authority) has launched in January 2004 and plans to reform its existing port information system (PORT-MIS) in accordance with a new management policy. PORT-MIS is a kind of administration support system that helps the arrival/departure process of ships. This administration system has mainly put emphasis on providing the function of report, permit, and information inquiry. Therefore, it is natural that the new organization needs a renewed port information system. Considering this background, this paper tries to seek optimum answers to the following three questions.

- Does a port information system have any relationship with its organization type?
- If they have close relationship, what is the functional difference of the information system by port type?
- If Busan port wants a renewed system, what approach is recommendable?

This paper is composed of 5 chapters. The second chapter discusses the characteristics by the typical four types of ports and their business scope, the third chapter deals with the characteristics of information system by port type, and the last chapter suggests the development strategies for BPA information system.

Ⅱ. Characteristics by Port Type

From long ago, most ports of the world have established their own port type proper to their surrounding environments. These port types can be grouped into four types: state-run, public corporation, local government-run, and private ownership[1].

The state-run port means that the central government directly owns and manages the port, and also sets up comprehensive plans. So, this port type is not good enough to provide customer-centered services, but is of help for stable port operation. In the case of public corporation, it is established and managed by the special law. For example, London port (PLA: Port of London Authority) and New York/ New Jersey port (NY/NJ: Port Authority of New York & New Jersey) belong to this group. The public corporation has its own independent rights on personnel and finance, and so it can be run by professional management on the basis of an independent accounting system, while providing customer-centered services. However, this type can cause some difficulties in the overall plan of a nation's ports.

The local government-run port is managed and operated by a governing body appointed by a city or a local government. Kobe of Japan, Rotterdam port, and Hamburg port belong to this category. The strong point of this port type is smooth port management, but it can bring about intervention of local government, and shortage of both investment resources and professional manpower.

The typical examples of privatization are ABP (Associated British Ports), PSA (Port of Singapore Authority), and Hong Kong port. In this port type, the profit-oriented private enterprise directly owns and run its port, thus providing better customer services than the other types. However, because of its profit-oriented purpose, it is afraid that it could raise port charge, while seeking its own interest instead of public interest[2]. The following table 1 shows ports by organization type.

표 1. 유형별 항만공사
Table. 1 Ports by Organization Type

Section	State-run	public corporation	Local Government-run	Private Ownership
Management System	State (central government)	Independent organization	Local government	Private enterprise

Port	Busan port before BPA, Iran, India, France	PLA, BPA, Le Harve, NY/NJ	Kobe, Rotterdam, Hamburg, Bremen	Britain, Singapore, Felixstowe, Hong Kong

Source: author has reedited FKI's (Federation of Korean Industries)(1997) Tasks for Enhancement of Port Competitiveness

The focal point of this chapter is to find out whether there is any difference in the business coverage according to the port type, i.e. state-run, public corporation, local government-run, and private ownership. To this end, this research team has conducted a survey of typical ports by organization type. The survey method we have adopted is the framework suggested by Baudelaire and Jean-Georges in 1986[3]. Based on the framework, we have asked questions through e-mail, and also directly visited to have interviews, and made use of materials sent to us by the ports. The survey period was from February to August in 2004, and the survey ports by type are shown in the table 2.

표 2. 조사대상 항만
Table. 2 Survey Ports by Organization Type

Type	Ports
State-run	Busan port before March 2004
public corporation	Busan port, London port, New York/New Jersey, Port of Le Havre
Local government-run	Port of Kobe, Port of Hamburg, Port of Rotterdam
Private Ownership	Singapore, Hong Kong, Britain

The survey items are largely grouped into three categories: ship's arrival and departure, cargo and passengers, and general services. According to the organization that is responsible for port management, each respondent's answer has been categorized into the following: local port authority, private undertaking, ministry of government, coast guard, independent organization, and chamber of commerce. The detailed survey items are as follows.

표 3. 세부 조사 항목
Table. 3 Detailed Survey Items

Section	Detailed Survey Items
The Ship	Fairways, channels, break-waters & similar works
	Turning areas, locks, docks & wharves
	Aids to navigation
	Navigation information & Radio Service
	Pilotage
	Towage & line handling
	Provisions, stores & bunkering
	Ship Repairs
Cargo and Passengers	Sheds & Passenger Terminals
	Other terminals
	Stacking areas
	Warehouses
	Tank farms
	Cranes & other handling appliances
	Cargo handling
	Lighterage
General Services	Conservancy
	Lighting
	Fire fighting
	Police force
	Labor amenities
	Sanitation

The results of our survey have shown the following significant facts.

(1) In the case of state-run or local government ports, the construction of channels and breakwaters has been carried out by their central governments. In the case of London port and Port of Le Havre, the local port authority is in charge of construction. In the case of privatized port, the private enterprise has directly carried out those works. Consequently, the business coverage of a public corporation and a privatized port is much broader than that of state-run and local government-run port.

(2) In the case of state-run port, fairway management and environment conservation have been conducted by central government, but in the case of public corporation including London port and privatized port, the port authority and the private enterprise have done it.

(3) As for pilotage, London port directly conducts it, but other ports have it done by an independent organization such as a pilot association.

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(4) General services such as safety and firefighting are being provided by central government in the case of state-run port, but in other cases, the public corporation or local government-run port is providing those services.

(5) Cargo handling including loading is carried out by private enterprises regardless of port type.

(6) Ship repairs, provisions, and stores & bunkering are being conducted by private companies due to their job feature regardless of port type.

표 4. 항만유형별 업무 담당조직
Table. 4 Job Coverage by Port Type

Job	State-run	Port corporation	Local government-run	Private ownership
Channels and breakwaters	Central government	Port Authority	Central government	Private enterprise
Port development	Central government	Port Authority	Port Authority	Private enterprise
Fairways	Central government	Port Authority	Central government	Private enterprise
Pilotage & towage	Private enterprise	Private enterprise	Private enterprise	Private enterprise
Repairs, provisions, stores	Private enterprise	Private enterprise	Private enterprise	Private enterprise
Loading	Private enterprise	Private enterprise	Private enterprise	Private enterprise
Safety and firefighting	Central government	Port Authority	Port Authority	Private enterprise
Information system	Central government	Port Authority	Port Authority	Private enterprise

With regard to port ownership and operation type, it is quite sure that the government, local government and private enterprise have respectively different business coverage of their own. Before 2004, Busan port had been managed by government. That is, all the property of Busan port was owned by the government, and management was conducted by the central government.

UNCTAD (United Nations Conference on Trade and Development) has explained as below why a government-run port is transformed into a privatized port[4]. For this reason, Busan port has decided to privatize its port management.

· Port user's demand is being diversified, and logistics volume is steadily increasing, but ordinary administrative unit or department has not been enough to satisfy diverse customer's requests. And as the case may be, some kinds of services were impossible due to a certain law or regulation.

· Privatization makes it easy to secure and enlarge financial resources when the port tries to expand its facilities and equipment.

· In comparison with state-run port, privatized port is easier to hire or dismiss employees, and also introduce flexible wage system. In addition, it can immediately respond to new problems.

The port run by a local government was similar to the former state-run Busan port. In October 2003, our research team visited Kobe port and had interviews with related officials. The research shows that both Kobe and Busan has a little difference in its management method, but that both ports were quite similar in their lack of willingness toward business[5]. As Kobe port is run by its port authority[1] and city authority, it has a dual management system. Therefore, it has no go-ahead attitude to reform compared with other local government-run ports in the western countries. Consequently, it was suffering deficit problem owing to its oversupply.

In the case of Hamburg port and Rotterdam port, their port management method was similar to Kobe port. Basically, their local governments have owned and have been developing the hardware side of port, i.e. performing the role of "landlord". However, the private enterprises that had leased moorings and hinterland have owned and been developing software side[2] of their port[3].

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1) In 1967, Kobe city has established a wharf corporation, which is to take charge of expanding port facilities for container cargo handling. Afterward, this public corporation has accomplished its mission and has been dissolved, and its business has been transferred to the local government. But the local government has judged that this business is not proper for local government to handle it, and so decided to establish a port authority. So, Kobe port has a dual system.

2) Software side covers crane, warehouse, road pavement, gantry crane, transportation vehicle, hinterland railroad, road, etc.

In the case of Hamburg port, the city's ministry of economic affairs was responsible for the port management and operation. He was in charge of port development, maintenance, repair, and construction of hardware side, decision-making on port charge, real estate lease, arrival and departure control, and channel conservation. Although Hamburg port has been run by the local government, we can easily find out that it is thoroughly adopting the management method of a private enterprise[6].

· In the last 10 years since 1990, cargo-handling volume has steadily increased 10.4% on average every year.
· In 2000, the port has 12,000 ships and 200 fairways, and is connected to 1,000 ports of other countries.
· Every year it holds 2,000 times of exhibitions, explanation meetings and seminar, while putting emphasis on port marketing and information services for customers.
· Partnership between city authority and private sector is well harmonized, thus effectively making efforts to improve customer services.

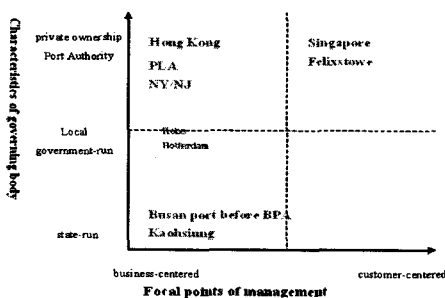The below figure show the focal points of management by port type.

그림 1. 항만유형별 경영 주안점
Fig. 1 Focal Points of Management by Port Type

III. Characteristics of Information System by Port Type

As mentioned above, major ports of the world are adopting their own information system to provide better services to customers. This chapter discusses the characteristics of information systems run by four types of ports. In an effort to prove the hypothesis that the function of information systems could be different depending upon their port type, we have adopted the following items.

· The scope of research is confined to port administration support system, cargo inventory management system, and e-commerce system.
· Concerning data transmission, two methods – an exclusive line and Internet – will be reviewed.
· Connection to other systems including customs office and data linkage will be examined.

This research covers the following information systems: PORT-MIS of Busan port, DAKOSY of Hamburg[7], PACE (Port Automated Cargo Environment) of London[8], PORTNET of Singapore[9], HIT of Hong Kong (Hong Kong International Terminals)[8]. The PORT-MIS of Busan before 2004 was a typical information system among many state-run ports. Therefore, the review on the function and characteristics of PORT-MIS can be a good case to find out the limits of state-run information system. Since adopted by Busan port, PORT-MIS was also introduced to all the other ports of Korea, thus making port administration very effective regardless of time and space, and reducing required documents from 75 to 16, and handling time from 2 hours to 2 minutes [10]. In spite of all these achievements, it still had many problems.

· It had provided only minimum administrative services necessary for the arrival and departure of ship and cargoes.
· Manifest data for customs clearance and cargo data for port authority were duplicate.
· There was no serious effort to develop B2B systems such as container transfer B2B, transportation B2B, shipment B2B, and empty container B2B.

· It had made no attempt to reduce user's corresponding expenditures by using Internet.

· No efforts had been made to increase synergy effect by sharing information on cargo-related data among shippers, shipping companies, transporters, forwarders, stevedores, and public office.

· Through information sharing on ships, container terminal, customs office and shipping companies, it was able to pursue the location of cargoes, but no such efforts had been made.

Likewise, the information system of a state-run port has showed a sharp contrast with a public corporation or a privatized port in terms of cost reduction and profit maximization. The typical cases of public corporation are PLA and NY/NJ. Their port management principle isa through independent accounting system. Without depending on the government's subsidy, they invest their earned profits in the development of ports. Of course, they have to make enough profits to provide better services. They have also provided diverse information services for customer satisfaction.

In November 2003, in order to survey the PACE of PLA (Port of London Authority), our research team visited and had interviews with PACE developers, and found out the following facts.

· PLA is to facilitate electronic submission and clearance of customs entries, and provide on-line access to customs.

· The strong points of PACE is that it is a community system, so that port users provide mutual cooperation for effective operation of the system, that is, it is a voluntary cooperation system.

· It provides all information on the situation of containers that are to pass London container terminal.

· While sharing information on manifest data, all community members are performing the jobs such as customs clearance, gate passage, smuggler checking, warehouse, ICD (Inland Container Depot) charge, transfer handling, hinterland transportation, cargo loading and port charge.

· PACE provides on-line access to CHIEF (Customs Handling of Import and Export Freight).

· For user's convenience, PACE provides portal services[11], thus giving information on cargo handling to the shipping companies, customs office, warehouse, and terminal.

· However, PACE has not yet started to build up e-commerce system for the online service of port-related business.

In the case of Kobe port, which is a local government-run port, its EDI (Electronic Data Interchange) has a similar function with PORT-MIS of Busan. Most Japanese ports including Kobe were independently developed under the local government system, and so the following problems have happened[12]. Because of this, the existing system was transformed into a single-window system in July 2003[3]. The EDI system of Kobe was developed as a port administration system, so it has been quite different from the community system of European ports. The problems of Kobe's EDI system are as follows[13].

· Users have to prepare documents every time and submit them to the administrative offices.

· There are many duplicate items, and only a few documents were computerized.

· Sea-NACCS of customs office uses an exclusive line, and port EDI uses Internet system, thus causing inconveniences in transmission.

We have checked the other two local government-run ports – Hamburg and Rotterdam. The leading European port of Hamburg is using the information system of DAKOSY, and Rotterdam has adopted INTIS, but both

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3) Various kinds of reports - reports to the head of port, port manager, quarantine, customs, and bureau of arrival and departure -can be done with one time input.

ports have not yet shared the information on cargo data[14]. In the sense that their systems provide EDI function, they are similar to Busan and Kobe. But in the sense that they have more advanced software for customer services, we could find out differences between them.

· DAKOSY has both functions of EDI and ASP (Application Service Provider). ASP covers diverse systems such as dangerous goods monitoring, import and export monitoring, port and railroad, inspection report, truck communication, marine documents issue, ship's departure information, and shipment order information.

· For safe handling of dangerous goods, DAKOSY is connected to "Protect System" in which many ports such as Antwerp, Bremen, Felixstowe, Le Havre, and Rotterdam have participated.

· INTIS established in 1985 provides the function of mailbox, so that many participants such as customs office, bureau of maritime affairs, forwarder, and transporter are using this system for effective

information exchange.

· INTIS has developed an INTRACON based on EDIFACT rules.

· INTIS connected to SAGITTA (tariff system of Netherlands) is being used by forwarders, shipping agents, and importers for the sake of import reporting.

Now let's have a look at the information system of privatized ports. The typical privatized port PSA (Port of Singapore Authority) has PORTNET, CITOS, BOXNET and FastConnect in its information system.

· PORTNET, CITOS, and BOXNET among PSA information system are playing a critical role, while providing e-commerce to meet diverse customer's demand.

· PORTNET has 1,500 users, and provides diverse functions such as online order, order fulfillment check, track and trace, business process support for customers, data storage, financial function, etc.

· CITOS is a real-time computerized system for three

표 5. 항만유형별 정보시스템 특성
Table. 5 Characteristics of Information system by Port Type

Section	Port	System Function	Standardization, Corresponding method	Common use of cargo data
State-run	PORT-MIS of Busan	▪ Arrival and departure report ▪ Facility management ▪ Charge collection ▪ Application permit	▪ VAN-EDI ▪ Online	▪ 765 subscribers ▪ Don't have cargo data in joint use with container terminal and customs office
Local government-run	DAKOSY of Hamburg	▪ Seaport documentation system for forwarders ▪ Customs documentation system ▪ Agent's container transport improvement & organization network	▪ Exclusive line ▪ Internet	▪ 830 subscribers ▪ Linkage to manufacturers,forwarders, shipping companies, customs, police station, fire office ▪ No system for common use of data
	EDI of Kobe	▪ Arrival & departure report ▪ Facility management ▪ Charge collection ▪ Application permit	▪ Exclusive line ▪ Internet ▪ E-mail ▪ Fax	▪ Arrival & departure report by Sea-NACCS ▪ No common use of cargo data
Port corporation	PACE of PLA	▪ Cargo inventory ▪ Access to chief ▪ Internet portal	▪ Internet linkage to CNSNet	▪ 200 subscribers ▪ Common use of cargo data
Private ownership	PORTNET of Singapore	▪ CITOS ▪ BOXNET ▪ PORTNET ▪ FastConnect	▪ Exclusive line ▪ Internet	▪ 1,500 subscribers ▪ Common use of cargo data

container terminals, and provides services such as operation, shipment, berth, storage, stevedoring and yard management.

· Through BOXNET, which is an information system for vehicles, transporters can receive information on container movement plan, but in the case of shipping note, they use PORTNET.

· FastConnect provides a linkage service for transfer cargoes, helping shippers to seek feeders, thus reducing the handling time of transfer containers.

· PSA information system provides the B2B system for shipper, shipping company, transporter, logistics dealer, terminal operator, port authority, government organization, and NVOCC. This means it makes good use of e-business.

In this chapter we have tried to prove our hypothesis that the information system of a port can be differentiated according to the port type. However, strictly speaking, there was not much difference among different port types. We could not find out that the EDI of Kobe is more advanced than PORT-MIS of Busan. Rather, the PORT-MIS of state-run port is more advanced than the local government-run Kobe port in terms of standardization and data exchange between ports. This means that the information system of a state-run port can go ahead of that of a local government-run port.

However, if we compare it with that of a public corporation or a privatized port, we can point out significant differences. In particular, these differences were definitely found in the e-business environment such as cargo inventory system, port community building, and diverse B2B system as shown in the table 5. Considering these facts, if we simplify the port type into two groups - one is state-run and local government - run port, the other is public corporation and privatized port, we can point out distinctive differences in their information systems by port type.(table 6)

표 6. 항만유형별 정보시스템 도입 현황
Table. 6 The relationship between port and the contents of IS

Section	Declaration	Community System	e-Commerce
State-run, Local government-run	Growth stage	Not Applicable stage	Adoption stage
Private ownership, Port Authority	Growth stage	Growth stage	Adoption stage

IV. Development Strategy of BPA Information System

BPA that has been established by the law[15] of port authority in April 2004 has inherited all of its businesses from the former state-run organization.[4] But at this point in time BPA is required to have a fresh start with new management goal and business scope to create customers through service improvement. The success factors of PSA information system will be of help for BPA. PSA's success factors are well pointed out as follows in the J.E. Lee-Partridge's paper[9].

· A business-centered system should be developed.
· IT system has to be compatible with its business.
· Infrastructure is required to be flexible and expandable.
· Creativity and reformation are critical factors.

By applying PSA success factors to BPA information system, we can create the following reconstruction directions:

· As BPA's management goal[16] is to be a hub port in the Northeast Asia, its information system should correspond to the management goal.
· To be a hub port in the Northeast Asia, BPA must improve customer services. To this end, it is to build up a community information system and

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4) Construction, repair and maintenance of port facilities, dredging, port management and operation, lease and charge collection, R&D, technology development, manpower education, construction and management of living facilities and welfare facilities for port users.

e-business information system.

· Instead of VAN-based EDI system, Internet-based network infrastructure should be established.

· To pursue creativity and reformation in the IT sector, CIO (Chief Information Officer) system should be organized directly under the CEO.

· To enhance software function and to build business-oriented system, combination of outsourcing and inhouse development is desirable.

· For long-term system development, the following three-stage plan is recommendable:

(1) 1st stage: Productivity enhancement stage

- The stage to mirror PORT-MIS to stabilize overall business of BPA

(2) 2nd stage: Quality improvement stage

- Introduction of a cargo inventory system just like PACE of PLA and PORTNET of PSA

- Providing cargo and truck tracing system using GPS

(3) 3rd stage: Revenue increase stage

- Introduction of PSA's customer-oriented e-commerce system and portal system

- Customer-centered tailored services and specialized services toward each individual and each group

- Establishment of strategic decision system

표 7. 항만공사 정보시스템의 단계별 도입 방안
Table. 7 Three-Stage Plan of PA Information System

Stage	Stage	Achievement Goal
Revenue increase	3rd stage	· Tailored information system for each individual customer and group customers
Quality improvement stage	2nd stage	· Establishment of a linkage system to the information systems of other institutions. · Provision of globalized port information service
Productivity enhancement stage	1st stage	· Transfer of PORT-MIS and operation stabilization

Ⅴ. Conclusion

On the occasion of BPA foundation, this paper has tried to seek a new development strategy for its information system. Busan port has been transformed from a state-run port to a public corporation. Therefore, its information system also has to be renewed. Accordingly, the focal point of this research is to find out whether there is any difference in their information system by port type, and if so, what kinds of different characteristics are there in their information system?

As a result of our research, we have confirmed that there is no difference in their respective information system between a state-run port and a local government-run port. However, there were clearly different characteristics in their respective information system between a public corporation and a privatized port. These differences have mainly come from the community system for cargo inventorymanagement and e-business system. Based on this research, we have suggested a new development strategy for BPA information system.

In the process of our research, we have discovered another important task. It is the community system of the advanced European ports. We want to know whether this system has been developed because of their privatization system or naturally created by cooperative efforts of western society. However, as this task is beyond the theme of this paper, further study could be made at the time when BPA plans to introduce the community system.

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저자소개
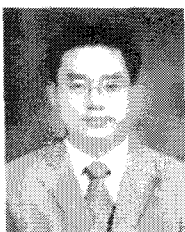
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APPENDIX. Typical Ports by Organization Type

Section	Detailed Survey Items	State-run	Public Corporation				Local Government-run			Private Ownership		
		French	BPA	London	New-York	LeHavre	Hamburg	Kobe	Rotterdam	ABP	Hong Kong	Singapore
The Ship	Fairways, channels, break-waters & similar works	PW	PW	PA	CE	PA	PW		PW			
	Turning areas, locks, docks & wharves	PW	PW	PA	PA	PA	PA		PA			
	Aids to navigation	PW	PW	TH	CG	PW	PW		PW			
	Navigation information & r-t service	CC	PW	PA	CG	CC	PA		PA			
	Pilotage	IB	IB	TH	IB	PV	IB		IB			
	Towage & line handling	PV	IB	PA	PV	PA	PV		PV			
	Provisions, stores & bunkering	PV	PV	PV	PV	PV	PV		PV			
	Repairs	PV	PV	PV	PV	PV	PV		PV			
Cargo And Passen-gers	Sheds & passenger terminals	CC	PW&PA	PA	PV	PA	PA&PV		PV			
	Other terminals	CC&PV	PW	PA	PV	PA	PA&PV		PV			
	Stacking areas	CC	PV	PA	PV	PA	PA&PV		PV			
	Warehouses	CC	PV	PA	PV	PA	PA&PV		PV			
	Tank farms	PV	PV	-	PV	PA	PA&PV		PV			
	Cranes & other handling appliances	CC	PW&PA	PA	PV	PA	PA&PV		PV			
	Cargo handling	PV	PV	PA	PV	PA	PA&PV		PV			
	Lighterage	-	PV	PV	PV	-	PA&PV		PV			
Land Carriers	Roads	PW	PW	PA	PA	PA	PA		PA			
	Lorry & car parks	CC	PW	PA	PV	CC	PA		PA			
	Lorry appointment schemes	-	-	PA	-	-	-		-			
	Railway tracks & marschalling yards	IB	PW	PA	IB	PA	IB		IB			
	Wagon appointment schemes	CC	PW	-	-	CC	-		-			
	Waiting docks (inland waterway craft)	PW	PW	-	-	PW	PA		PA			
	Pipes	PV	-	-	PV	PV	PV		PV			
General Services	Conservancy	PW	PA	PA	CE	PW	PW		PW			
	Lighting	CC&IB	PA	PA	PA	CC&IB	PA		PA			
	Firefighting	CC	PW	PA	PA	CC	PA		PA			
	Police force	IB	PW	PA	PA	PA	PA		PA			
	Labour(Labor) amenities	CC	IB	PA	PA	CC	-		PV			
	Sanitation	CC	PA	PA	PA	CC	PA		-			
	Port type	t	l	l/o	l	t	l/t		l			

PA : Local Port Authority
PV : Private undertaking
PW : Ministry of Public Works or any other Ministry having similar responsibilities.
    In the Federal Republic of West Germany, these responsibilities rest with the
    Federal Government
CC : Local Chamber of Commerce(French Ports)
CE : Construct Engineering

CG : Coast Guard
IB : Independent body or organization
TH : Trinity House(Great Britain)
r-t : Radiotelephone service
l : Landlord port
o : Operating port
t : Tool port
- : The information is not available or irrelevant

Source : Baudelaire, Jean-Georges(1986), Port Administration and Management, Tokyo, IAPH, 90-92.