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International case studies and good practices for implementing Port Community Systems

Integration and Trade Sector
Infrastructure and Energy Sector

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ABBREVIATIONS

Abbreviation	Meaning
APCS	Antwerp Port Community System
B2B	Business-to-business
B2G	Business-to-government
BRM	Business relationship management
CBRCS	Cross-border regulation and control systems
CBRSW	Cross-border regulations single window
CCS	Cargo community system
CMS	Customs management system
ECP	Empty container park
EDI	Electronic data interchange
EPCSA	European Port Community System Association
ESPO	European Sea Ports Organisation
IPCSA	International Port Community System Association
G2B	Government-to-business
ICS	Integrated cargo system
ICT	Information and communications technology
IP	Intellectual property
IT	Information and technology
KPI	Key performance indicator
LCS	Logistics collaborative systems
MPSW	Maritime and port single window
NSW	National single window
NVOCC	Non-vessel operating common carrier
OPS	Operational performance system
PA	Port authority
PAV	Valencia Port Authority
PCS	Port community system
PPP	Public–private partnership
RACI	Responsible, accountable, consulted, informed
RO-RO	Roll-on, roll-off
SCP	Supply chain participant
SME	Small and medium-sized enterprise
SOA	Service-oriented architecture

Abbreviation	Meaning
TEU	Twenty-foot equivalent
VBS	Vehicle booking system
WCO	World Customs Organization

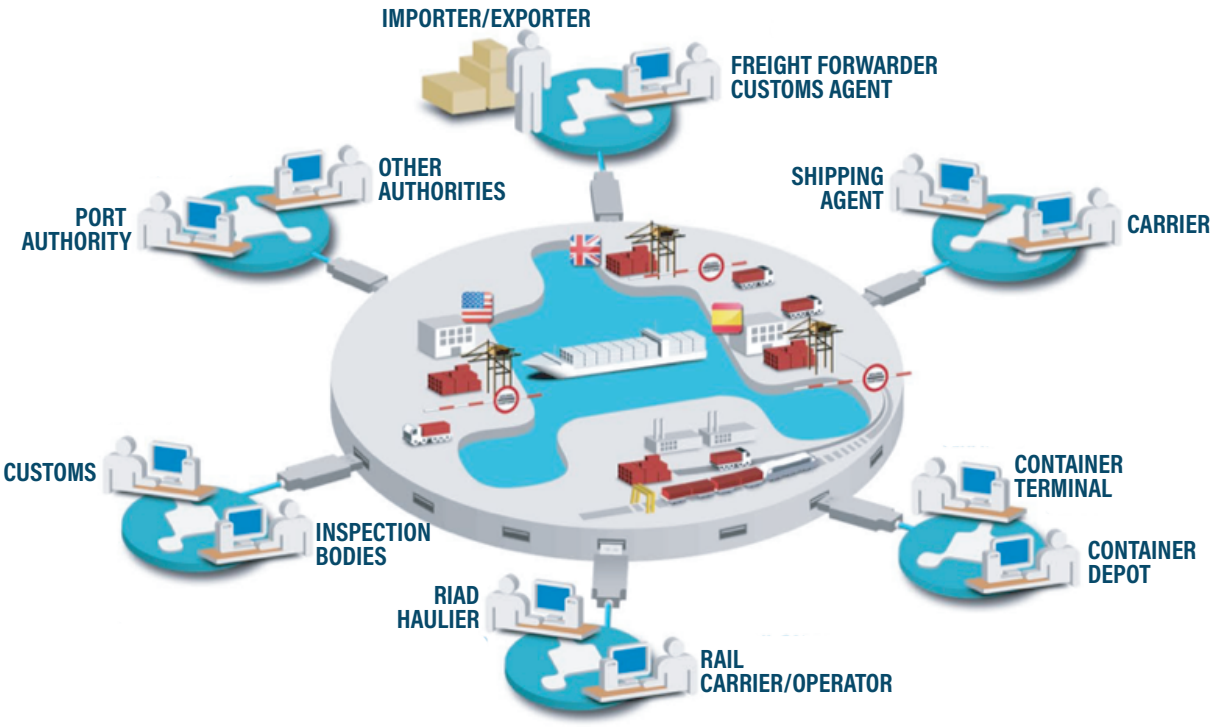
EXECUTIVE SUMMARY

A significant number of players take part in everyday port activities, serving port traffic directly or indirectly. These independent public and private players form a "port community," where each player can be considered a department of the same virtual company tied together by a common interest in maritime and air transportation. Effective coordination and collaboration between these various departments are essential if a supply chain is to function properly—that is, its cargo is to be delivered to its destination on time and at a competitive price.

Most port communities still experience problems that are not in line with the current digital transformation in the port industry: low IT penetration, especially for inland parts of the supply chain; fragmented industries with multiple screens from different systems; unnecessary numbers of communication channels; difficulty in uncovering information origin errors when they occur; heavy use of manual transactions; excessive rekeying of information; and unnecessary and wasted (truck) movements.

Port community systems (PCSs) can address these and similar challenges. PCSs are neutral and open electronic platforms that optimize, manage, and automate seaport and airport logistics processes through single submissions of data, enabling intelligent and secure information exchange between public and private stakeholders.

FIGURE 1. A PCS can be viewed as a "virtual table" formed by the port community

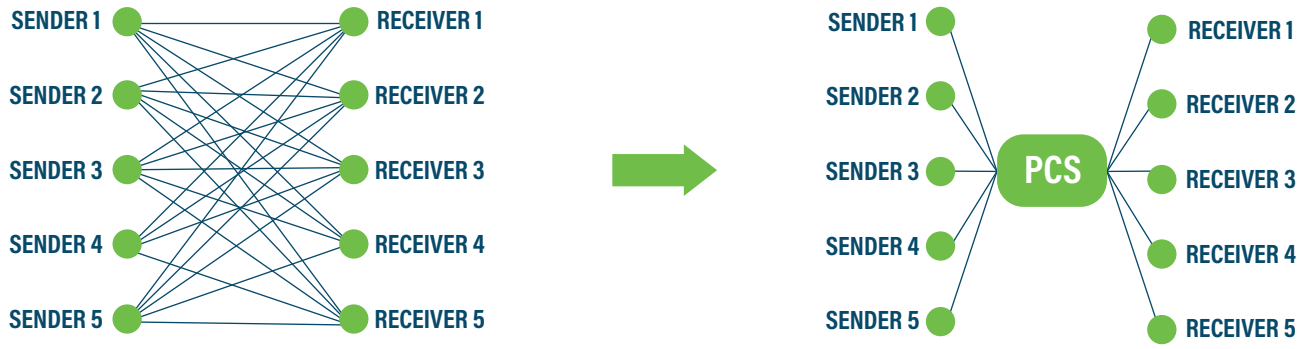


Source: ValenciaportPCS.net

Usually, PCS solutions offer services for sea, air, port, and landside operations,[1] but it is important to highlight that their implementation does not need to compete with users' existing systems. Instead, the objective is to integrate all the information needed for supply chain processes into one platform. Some of this information is already available in various stakeholders' systems.

PCSs thus enable the simplification, standardization, and acceleration of information exchange among supply chain participants (SCPs). They are also responsible for increasing the efficiency of interactions between the various private SCPs and government bodies such as customs and maritime and port authorities in authorizing, monitoring, controlling, and verifying port processes.

FIGURE 2. Interaction flows between SCPs before and after implementation of a PCS



Source: Port of Antwerp

The benefits of using PCS solutions depend on each type of user, but there are some overall benefits to the community:

- Time to market is reduced through services that handle booking, scheduling, tracking, and documentation.
- The entire door-to-door shipment process can be tracked and traced.
- Trade permit declarations can be simplified using PCS services to assist the cargo clearance process.
- Gate clearance at the port is automated.
- Information allows haulers and truckers to better plan movements which can improve overall turnaround times.
- The number of processes and documents exchanged decreases.
- Vast amounts of information can be handled faster.
- Redundant data entries are eliminated by interfaces between systems, making data acquisition more reliable.

Overall, PCSs save money in port operations and add value to these and to logistics and transportation chains. As an example, it has been estimated that the ValenciaportPCS in Spain saves around €23 million each year across the whole port com-

1 Though Port Community Systems remain predominantly focused on maritime supply chains and ports, the inclusion of SCPs involved in air cargo (some of whom are also involved in maritime cargo) is a significant benefit, particularly in small countries. This report will focus primarily on sea trade and ports.

munity. Similarly, Portnet, the PCS currently operating in Singapore, has reportedly generated savings of over $80 million over a three-year period (Port Strategy, 2012).

The successful implementation of a PCS is directly related to the design of its business model. Issues related to ownership, the operation model, revenue streams, and services orientation need to be defined based on the stakeholders involved. As a result, each port community has its own legal and institutional characteristics, which in turn affect the design of its business model. It is important to note that a PCS is not just a technological solution. The real challenge to successful implementation lies in overcoming resistance to change among different public and private stakeholders.

In line with the information above, there is no single funding model for PCS solutions. Instead, funding decisions usually depend on the PCS governance structure and the main target groups that stand to benefit from PCS operations. The most common funding schemes are the following:

- **Public funding** (e.g. Port of Valencia, Port of Rotterdam and Amsterdam, and Port of Antwerp)
- **Public–private partnership (PPP)** (e.g., Port of Barcelona, Port of Marseille)
- **Private** (e.g., Port of Singapore, Port of Hamburg, Port of Felixstowe).

The lessons learned from the eight overseas initiatives analyzed in this report give countries and port communities valuable guidance on how to implement a PCS cost-effectively. Once it has been decided that a PCS will be implemented, a set of actions to mitigate potential conflicts among stakeholders and to enhance understanding of the proposed model should be followed. These are:

- **Build the community.** The key is to build a true community of SCPs where each stakeholder recognizes that the benefits of working together toward a common goal are greater than working separately.
- **Set a benchmark point.** Determining where all stakeholders stand in terms of information and processes at the beginning of the project means that benefits can be quantified as the project progresses.
- **Use the business relationship management (BRM) approach to design the relational model for the PCS.** This offers a useful approach to providing a complete and holistic model of business relationships and value over time, making the various aspects of business relationships both explicit and measurable.
- **Build a simulator.** This will demonstrate the anticipated benefits that a PCS can bring to the port community in supporting decision-making.
- **Start with case studies**. While a simulator can deliver reliable information, this information alone may not be enough to persuade stakeholders to commit to a PCS. Case studies can build on this to provide real-life examples and mitigate lingering concerns.
- **Seek alliances with "power players."** Some stakeholders in a port community are in a better position to exert influence and bring about the adoption of a PCS.
- **Foster and maintain good relationships with incumbent IT providers.** A

PCS must work with current IT platforms and cooperate to develop a win-win arrangement wherever possible.

- **Develop cloud- and/or web-based applications.** SMEs do not have strong incentives or the required funds to invest in IT solutions and thus are heavily dependent on manual transactions. This must change if a port community wants to move toward a paperless supply chain. The development of cloud- and/or web-based applications are an ideal strategy toward this end.

1

1 INTRODUCTION

The objective of this report is to describe international solutions and good practices for PCS solutions based on key drivers for successful PCS implementation, as described by the International Port Community System Association (IPCSA).[2] These key drivers are business model types, management structures, potential PCS services, technological baselines, and the regulatory, legal and institutional frameworks needed.

Eight PCS initiatives were selected and detailed in this report, giving countries valuable guidance on developing PCSs cost-effectively. These initiatives are: Antwerp Port Community System—APCS (Antwerp, Belgium); DAKOSY (Hamburg, Germany); Destin8 (Felixstowe, United Kingdom); PORTBASE (Rotterdam and Amsterdam, Netherlands); PORTIC (Barcelona, Spain); Portnet (Singapore); AP+ (Marseille, France), and ValenciaportPCS (Valencia, Spain).

Section 2 defines key concepts and drivers in the establishment of a port community system, and section 3 discusses forms of governance and other factors which comprise a PCS business model. Models adopted by recognized international PCSs are then outlined and explored. The focus of section 4 are the funding options and the types of fees which are usually applied to guarantee that objectives are met.

Sections 5, 6, and 7 discuss aspects related to the services a PCS can offer, and the technological and legal aspects which need to be considered to support to the implementation and operation of the platform. A series of recommendations and good practices are presented in section 8, which aims to offer readers a path to effectively implementing PCS projects in their own port communities.

2 IPCSA is the successor to the European Port Community Systems Association (ECPSA) which was launched in June 2011 by six founding members, all European-based PCS operators. IPCSA and its members play a vital role in global trade facilitation by supporting the implementation of PCS at hundreds of seaports, airports, and inland ports. The reason for forming EPCSA was that PCS operators did not have a common lobby position within the European Union. IPCSA is a neutral organization which provides guidance and shares lessons learned for governments and the private sector. See www.ipcsa.org for further information.

2 DEFINITION OF PORT COMMUNITY SYSTEMS

A clear definition and common understanding of the concept of PCS solutions is essential to grasping their strategic importance. Indeed, this is the first step recommended by the IPCSA (2011a) in its guide on developing PCSs. Stakeholders must agree on a definition early on, and this definition should be part of the public deliverables for the project.

According to IPCSA, a PCS is a neutral and open electronic platform that optimizes, manages and automates smooth port clearance and logistics processes through a single submission of data, enabling the intelligent and secure exchange of information between public and private stakeholders. Two key characteristics of a PCS are:

- It should be a neutral, open electronic platform that enables the intelligent and secure exchange of information between public and private stakeholders in order to improve the competitive position of the sea and airport communities.
- It should optimize, manage, and automate port and efficient logistics processes through a single submission of data, connecting transportation and logistics chains.

In some countries, a trade single window, a maritime single window, and a PCS (see table 1) already co-exist. Some embed their maritime single windows in their PCS, as is the case in the Netherlands. The three operate as separate systems in other places, with Spain being an excellent example. In South and Central America, most countries have a trade single window but very few have a PCS or maritime single window.

TABLE 1. Single window environments

Type	Function
Trade single window	Handles licenses and permits for the import and export of goods. A trade single window acts on the authority of a country's government.
Maritime single window	Handles vessel reporting formalities such as the arrival, stay, and departure of ships, advance electronic cargo information, port reception facilities, and crew shore leave information.
Port community system	A PCS is a logistics single window and is concerned with electronic bills of landing, port services, transportation services, etc.

Source: Compiled by the author.

Essentially, PCS solutions are a response to the need to maximize physical infrastructure utilization and manage the efficiency of port operations. The vision of a PCS should be to enable the electronic exchange of information between all port and logistics sectors. PCSs are acknowledged to be the most advanced method exchanging information and facilitating commercial interactions within a single port or a

national port community. The system exists in an environment where a significant number of stakeholders play different roles in trade, supply, logistics, and transportation chains. A PCS presupposes the active involvement of all SCPs from terminal and transportation operators—be they maritime, road, or rail—to freight forwarders, customs, cross-border regulatory bodies, and port authorities.

One of the reasons for creating PCSs is that port service users and customers need an increasing amount of information every day to innovate and optimize their own processes. Such innovations in the trade, logistics, transportation, and port sectors should not only address the internal needs of each individual company, but also those of the companies and other entities that make up the entire supply chain. **The strength of the chain is determined by the weakest link.** All parties involved in the transportation supply chain must make a firm commitment to innovation and prepare for the future by behaving like a "virtual enterprise."

Most companies are unable to tackle large innovations effectively on their own. Instead, these must be carried out through cooperative strategies by creating alliances with companies and government bodies that can handle such challenges. These alliances or communities take two forms:

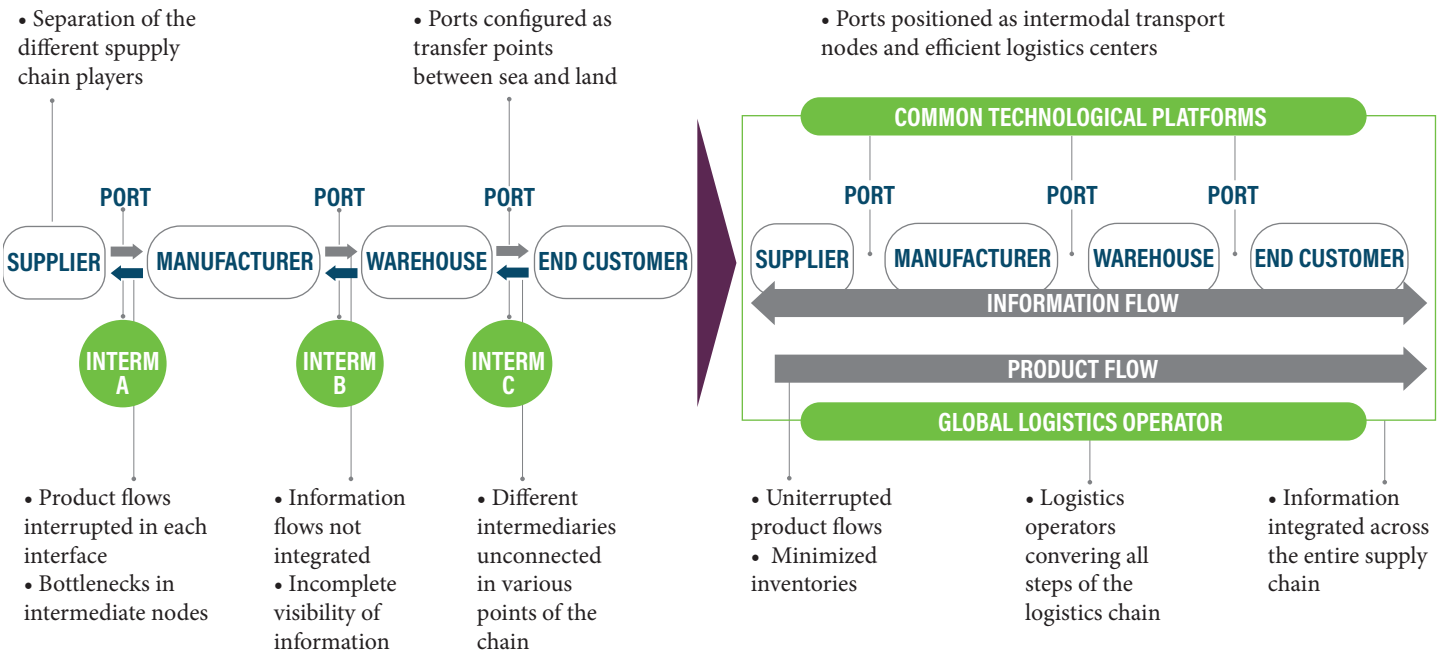
- Chain alliances, where a series of entities that are not competitors cooperate around certain services to implement innovation processes. One example is a door-to-door service with certain special features: an alliance could be formed between an ocean carrier, their agents in the ports of origin and destination, respectively, an international freight forwarder and their representatives, and a rail operator at the origin and another at the destination.
- Node alliances, where companies and entities that work around the same node can become allies. Two examples are a port community or a logistics platform in a given area. One of the characteristics of this type of alliance is that they include companies that are competitors, but which have joined forces to reach a common goal.

The goal of a PCS is not simply to support port operations—it is more about supply chain trade facilitation through shared information flows (figure 3). PCSs are designed to increase the visibility of core operations among the interdependent members of a supply chain, enabling better network optimization for individual operations/operators and the sector.

Modern logistics chains demand efficiency at each step of the supply chain. Unlike traditional chains, they envision an uninterrupted flow of products and information, which eventually helps minimize inventories. Logistics operations should be able to cover all steps in the logistics chain, in which ports are positioned as intermodal transportation nodes and logistics centers enabling the integration of the information across the entire supply chain.

Leading ports have reacted to this challenge by investing in technology, which is less expensive than infrastructure. PCS solutions can contribute to the creation of modern logistics chains as they are a "one-stop shop" where the whole port community can share information.

FIGURE 3. Modern vs. traditional logistics chains



Source: Valencia Port Authority

2.1 Ports as Virtual Enterprises and the Role of PCSs

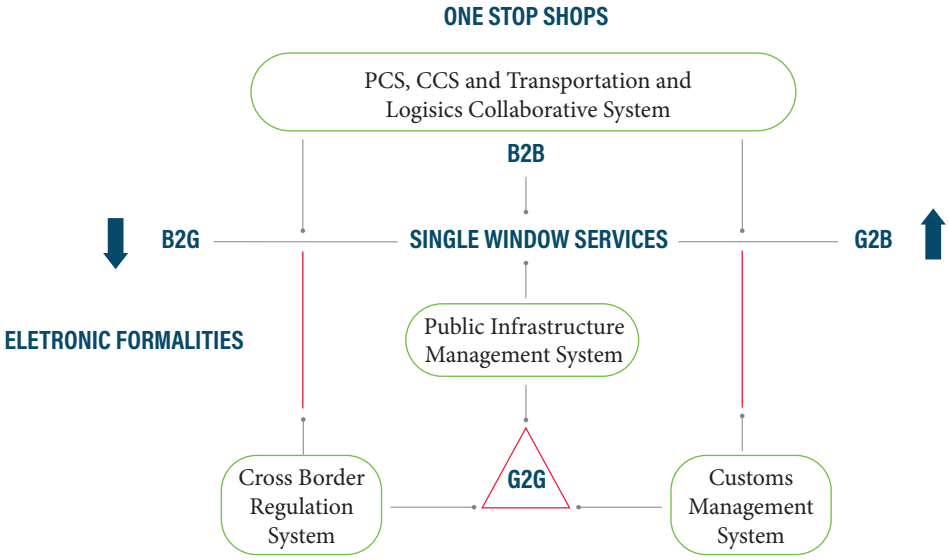
A port is like a virtual enterprise where a cluster of companies comes together to provide a single face to the customer. In most cases, the front-end company providing services to the port user does not necessarily provide all the underlying services. In fact, a port's front-end reveals very little about the numerous processes, document exchanges, and organizational arrangements that go into delivering the service (Figure 4).

The effective coordination and collaboration of the various departments of a "virtual" company of this sort are essential to the supply chain functioning properly—namely, the container being delivered to its final destination on time and at a competitive price. However, this is not possible without the uninterrupted exchange of information generated by the multiple parties engaged in shipping a single container. A given SCP needs to receive specific data items from one or more downstream stakeholders. These information packages are then processed internally to develop new documents and data items, which are eventually delivered to upstream stakeholders.

The information exchanged within a port supply chain is often duplicated, as much of the data is repeated in various documents (e.g., bill of lading, voyage number, and so forth). Meanwhile, standardization has traditionally been limited in the shipping industry, and the same data can be interpreted or used differently by two or more SCPs. Under these conditions, traditional communications via phone calls, faxes, and emails can result in multiple mistakes, the need to re-enter information, and extensive wastes of time and human resources. More importantly, they hinder opportunities for innovation, advanced planning, and optimization. This is easily understood if, for example, a given company tries to optimize its operations without having the

data it needs to hand in a valid, reliable format. These constraints make optimization either unfeasible or, worse, misleading, as they lead to invalid results and cannot effectively support decision-making.

FIGURE 4. The port as a virtual enterprise



Source: Fundación Valenciaport

A PCS operates as a "one-stop shop" that supports the commercial transactions of the virtual enterprise by being the *only* information carrier. It handles data input and output and orchestrates the business processes associated with information exchange. A typical online transaction may involve numerous business processes, document exchanges, and companies (and their respective management systems). Nevertheless, this transaction can take place within a few seconds because pre-orchestrated business processes are sequentially executed "behind the scenes" through the exchange of highly standardized electronic messages between various parties. In this case, the different organizations' IT systems are fully interoperable and use standardized messaging procedures.

For example, a PCS enables a shipping line to request permission electronically from a port authority to berth a vessel and to receive authorization back electronically. The PCS may also allow freight forwarders to book container slots in a vessel, arrange land transportation to pick up empty containers, or send the cargo manifest to customs and receive an electronic customs clearance, all in electronic form.

A one-stop shop gives traders a simple view of port-related transactions without them having to be completely aware of the complex and carefully managed series of transactions that take place between different companies in the cluster. However, this is only one part of the story. Building a collaborative environment—as it is the case with PCS solutions—involves moving from a situation where each participating organization has its own independent concept of operations to a position involving process interdependencies and document exchanges. For most SCPs, this requires a paradigm shift in how they think about and run their business.

In sum, a PCS could be described as a one-stop shop or single shopfront where all electronic shipment transactions can be performed and the many participants in the cargo network are easily accessible, connecting both private and public stakeholders in a single communications channel. PCSs are therefore ideally placed for becoming gateways to the national single window environment (EPCSA, 2011b).

2.2 Key Drivers for the Establishment of a PCS

Traditionally, there are two key drivers for establishing a PCS:

- The need for a standardized communication platform to improve the timeliness and reliability of information exchange and minimize the associated costs.
- The need to increase the competitive position of ports.

The critical element in developing a PCS is for the different parties that make up the port community to reach a common understanding whereby they agree on the procedures to be followed for the benefit of the port's overall performance, despite those involved having divergent roles and different interests.

The main benefits of a PCS are based on a network effect and are exponential to the number and role of the stakeholders connected to the system. The motivations for implementing a PCS include many potential benefits. For example, PCSs can:

- reduce the administrative costs of documentation, communication, and information flows;
- enable timeliness, accuracy, and make information available 24/7;
- enhance the efficiency and productivity of port operations;
- increase a port's national, regional, and global competitiveness;
- foster intermodal competitiveness leading to more balanced modal distribution;
- fulfill customers' and stakeholders' requirements (eventually leading to increased satisfaction levels);
- fulfill the ports' policy requirements;
- enable the optimal use of expensive and often physically constrained port infrastructure;
- increase the security of vessel and cargo flows and improve monitoring of these by public bodies; and
- increase customers' satisfaction by monitoring and tracking container flows.

PCS solutions help simplify, standardize, and accelerate information exchange between SCPs. They are also responsible for increasing the efficiency of interactions between private SCPs and government bodies such as customs, maritime and port authorities, and so forth for authorizing, monitoring, controlling, and verifying port processes.

One key objective of a PCS is to add value and save money in port operations, as well as in logistics and transportation chains. As an example, it has been estimated that

the ValenciaportPCS in Spain has generated savings of up to €23 million across the whole port community (see Annex I), while Portnet in Singapore has reported savings of over $80 million over a three-year period (Port Strategy, 2012).

A PCS is commonly regarded as a strategic asset rather than a profit-oriented initiative. The complexity of PCS solutions and the number of stakeholders involved mean that traditional cost-benefit analysis is not the best way to assess their value.3 Direct and derived costs and benefits are attributed to a wide range of SCPs and hence are not easily quantified. Typical indirect economic benefits include the decreased cost of information access; lower communication costs for shipping lines; more accurate taxation and overall additional government revenue, namely through more transparent information, thus boosting revenue from taxes and user fees; prevention of smuggling; and prevention of illegal activity (Keceli et al., 2008). In addition, the flow-on benefits are not exclusively financial and hence are difficult to anticipate (Bezic et al., 2011). PCS solutions also provide increased competitiveness, increased information quality, improved operational performance, and safe paperless document exchange procedures for port authorities. All these gains have the potential to reduce time and cost to trade and contribute positively to country indicators for international benchmarking initiatives such as the World Bank's Doing Business index.

3 For example, for one PCS, efficiency savings may be expressed as $ per TEU, while for others it may be $ per transaction type or a mix of the two.

3 PCS GOVERNANCE AND BUSINESS MODELS

The successful implementation of PCS solutions is directly related to the design of their business model. Ownership patterns, operation models, revenue streams, and services orientation are to be defined based on the stakeholders involved. Each port community has its own legal and institutional characteristics that may also affect the design of this business model. Table 2 presents a list of the most common features that come into play in different PCS business models.

TABLE 2. Components of PCS business models

Target PCS Stakeholders	PCS Ownership Model	PCS Operations Model	Revenue Streams	PCS Services Orientation
▪ Authorities - Port authority - Marine - Customs - Immigration - Quarantine/ inspections ▪ Port operators ▪ Container terminals ▪ RO-RO Terminals ▪ Bulk terminals ▪ Shipping line agents ▪ Consolidators/ NVOCCs ▪ Freight forwarders ▪ Customs brokers ▪ Empty container parks ▪ Inland carriers	▪ Private ▪ Public–Private ▪ Public	▪ Private ▪ Public ▪ Public–private	▪ Subscription fee ▪ Fee per unit charge ▪ Fee per EDI transaction charge ▪ Fee per stakeholder	▪ Extension of port terminal operating systems. ▪ Wide spectrum (B2B, B2G, G2B) ▪ B2G single window to government services. ▪ G2G intergovernmental

Ownership and operational models. These are influenced by stakeholders, users, and the services you offered. A PCS can provide business-to-government (B2G) services (i.e., acting as a single window solution) or even government-to-government (G2G) services, thus enhancing intergovernmental connectivity and interoperability. The ownership model of a PCS can be private, public–private, or a purely public service usually operated by a port authority, a local/state authority or a national authority. Normally, when B2G and government-to-business (G2B) services are offered through a PCS, a public–private partnership is essential for monitoring and safeguarding essential public services.

TABLE 3. Examples of PCS business models

Ownership Model	Operational Model	Characteristics
Public	Public	In this scenario, the active involvement of the public sector is expected to enable tighter integration and interoperability with existing B2G and G2G information service platforms. Some negative aspects of this model are that, in some cases, public agencies lack the agility and efficiency to keep up with and incorporate the technological advances and new services demanded by private and public stakeholders. This scenario requires the provision of financial and governance support to ensure that a sustainable and attractive business model is developed, one that is of interest to private companies as operators.
Public	Private	In this scenario, public bodies play an active role in the PCS to ensure its services are provided fairly and neutrally to all stakeholders, while a private company operates the PCS on a commercial basis. The challenge here is justifying that the PCS' services are of a public nature and thus that the PCS should be regulated to protect port users from potential monopolistic practices around pricing schemes, information accessibility, neutrality, improper use of data, and equity.
Public–private	Private Public–private	This scenario requires the establishment of contractual arrangements between one or more public and private parties. Both underwrite the financial, technical, and operational risks. The creation of a so-called special-purpose vehicle company to develop, maintain, and operate the PCS for the contracted period may be able to provide operational PCS services that complement those already offered by existing private and public providers.
Private	Private	Some negative outcomes of this model are that information services and solutions provided could be fragmented and/or disconnected. There may be no incentive to develop services that are unprofitable to the PCS owner yet valuable to the nation (e.g., collecting data for infrastructure optimization and planning). There may also be a perception among some SCPs that the playing field is not level (i.e., dominant stakeholders receive preferred treatment). This could prevent the creation of a neutral and fair PCS solution for all SCPs and lead to the duplication of information flows, to the detriment of supply chain performance.

Business objectives. Overall, the main objective of a PCS is to add value and save money on port operations, logistics, and transportation chains. At the same time, the particular PCS model that is chosen will determine the specific financial model and objectives of the project. For example, a private PCS may set the profit maximization as its main operational goal. On the other hand, a public PCS may place more emphasis on self-sustainability and on maximizing the competitiveness and profitability of port community stakeholders.

Revenue streams. There are no clear restrictions in terms of the alternative fees and revenue policies adopted by PCS solutions other than acceptance by local stakeholders and compliance with local rules and laws. For example, ValenciaportPCS uses fees to cover operational costs but not to amortize the initial investment. Its services are classified as transactional services, information services, and professional services. Transactional services include both port community services and trade single

window services and are offered under a subscription fee. Information services are value-added services offered free of charge to transactional service users. Professional services are provided by the port community and IT experts on request and facilitate the integration of the PCS and in-house IT systems.

The following table shows the ownership and operation models and business objectives of the eight PCS case studies analyzed in this report.

TABLE 4. Examples of PCS business models

PCS Solution	Ownership Model	Operation Model	Business Objective
ValenciaportPCS (Port of Valencia)	Public	Internal department of the port authority	Not-for-profit
APCS (Port of Antwerp)	Public–private partnership	Private entity with public and private shareholders	Not-for-profit
Destin8 (Port of Felixstowe)	Private	Private entity	For-profit
DAKOSY (Port of Hamburg)	Private	Private entity	For-profit
PORTBASE (Port of Rotterdam and Amsterdam)	Public	Public entity	Not-for-profit
PORTIC (Port of Barcelona)	Public–private partnership	Private entity with public and private shareholders	Not-for-profit
Portnet (Port of Singapore)	Private	Private entity	For-profit
AP+ (Port of Marseilles)	Public	Public entity	For-profit

4 PCS FUNDING, FEES, AND TARIFF STRUCTURE

A PCS implements a portfolio of new operational functions within a port community, so it needs to find a good compromise between financial return on investment, success factors, infrastructure improvement, and any potential risks that introducing the project may pose to current business operations. Therefore, establishing a self-sustaining ecosystem is a critical long-term success factor for any PCS, where revenue generated from the PCS system is reinvested into maintenance, upgrading, and even adopting new technology without the need for a specific, fixed IT maintenance budget.

There is no unique funding model for a PCS. Funding aspects are defined based on a given project's governance structure and the stakeholders involved. In this regard, several financing models offer some examples, including:

- Public funding by port authorities or national governments (e.g., Port of Valencia, Port of Rotterdam and Amsterdam, Indian ports, Port of Antwerp);
- Public–private partnership (PPP)/private entity with public and private shareholders (e.g., Port of Barcelona, Port of Marseille);
- Private (e.g., Port of Singapore, Port of Hamburg, Port of Felixstowe).

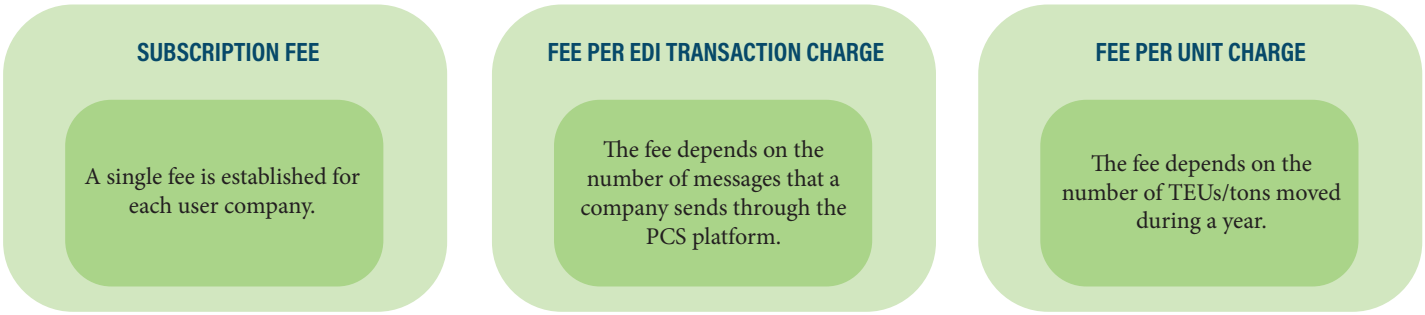
It is important to note that a PCS is not just a technological solution. The real challenge to successful implementation lies in overcoming resistance to change among different public and private stakeholders. PPPs are noteworthy in this regard: all parties invest equally and work is conducted jointly by establishing a private company limited by shares. In this model, shareholders' general income could finance services of strategic interest to the port.

In general, SCPs want to have strong control over their business and tend to oppose PCS fees set forth by their clients and providers. Therefore, SCPs will often be more amenable to a fee structure that promotes a level playing field—in other words, those that make SCPs' operations more efficient and/or improve these with minimum effort. In many cases, SCPs have been willing to pay for a PCS if it can be interfaced with their operating systems.

Overall, billing for services that truly offer demonstrable added value to SCP operations stands out as a good practice for defining the PCS fee structure. Individual SCPs are focused on their profitability and do a cost-benefit analysis at a stage in the process where they cannot clearly anticipate the immediate and indirect benefits of a PCS (i.e., better overall port community performance). Consequently, SCPs will react more positively if fees for PCS services are meant to cover the platform's operating costs rather than generating profit for the PCS entity.

In general, for each service, customers can choose between different subscriptions depending on their needs. The most commonly used PCS fees are shown below:

FIGURE 5. Most commonly used fee structures for PCSs



There are also mixed models that include a fixed payment per month and per-transaction fees. These models are especially attractive to companies that only make limited use of the PCS. As an example, ValenciaportPCS[4] sets a flat rate for each user which is based on that company's measured activity on the platform. The model reclassifies users every three months using the data available in the system, and uses one-year calculations for companies that have been using the platform for less than one year.

In addition to standard tariffs, specific rates could also be defined by PCS owners/managers when additional value-added services are provided. In this regard, special quotations could be charged for services such as email and instant notifications, third-party integrations, private integrations, and so forth. Specific administrative management fees could also be defined for user companies that decide not to make the payment by direct debit.

Finally, fee structures may also depend on the governance model for each PCS. For instance, as the Valencia Port Authority (PAV) owns ValenciaportPCS, the electronic service it provides is considered a "commercial service" and is therefore regulated by Spanish port law. In this regard, official rates are approved by the PAV board of directors.

4 For more information, see https://www.valenciaportpcs.com/media/1123/tariffs_valenciaportpcs.pdf

5 POTENTIAL PCS SERVICES AND TECHNOLOGICAL BASELINES

The shape that PCS solutions take depends on the type, breadth, and hierarchy of services the PCS will offer and the interdependencies of the various SCPs. The design and development of ICT solutions in ports require the current state of operations and the project state to be described for the trader, broker, transporter, port/intermodal nodes, and authorities participating in a given transaction. This will serve as a shared point of reference for all stakeholders as they engage in the design and implementation of new business process architectures.

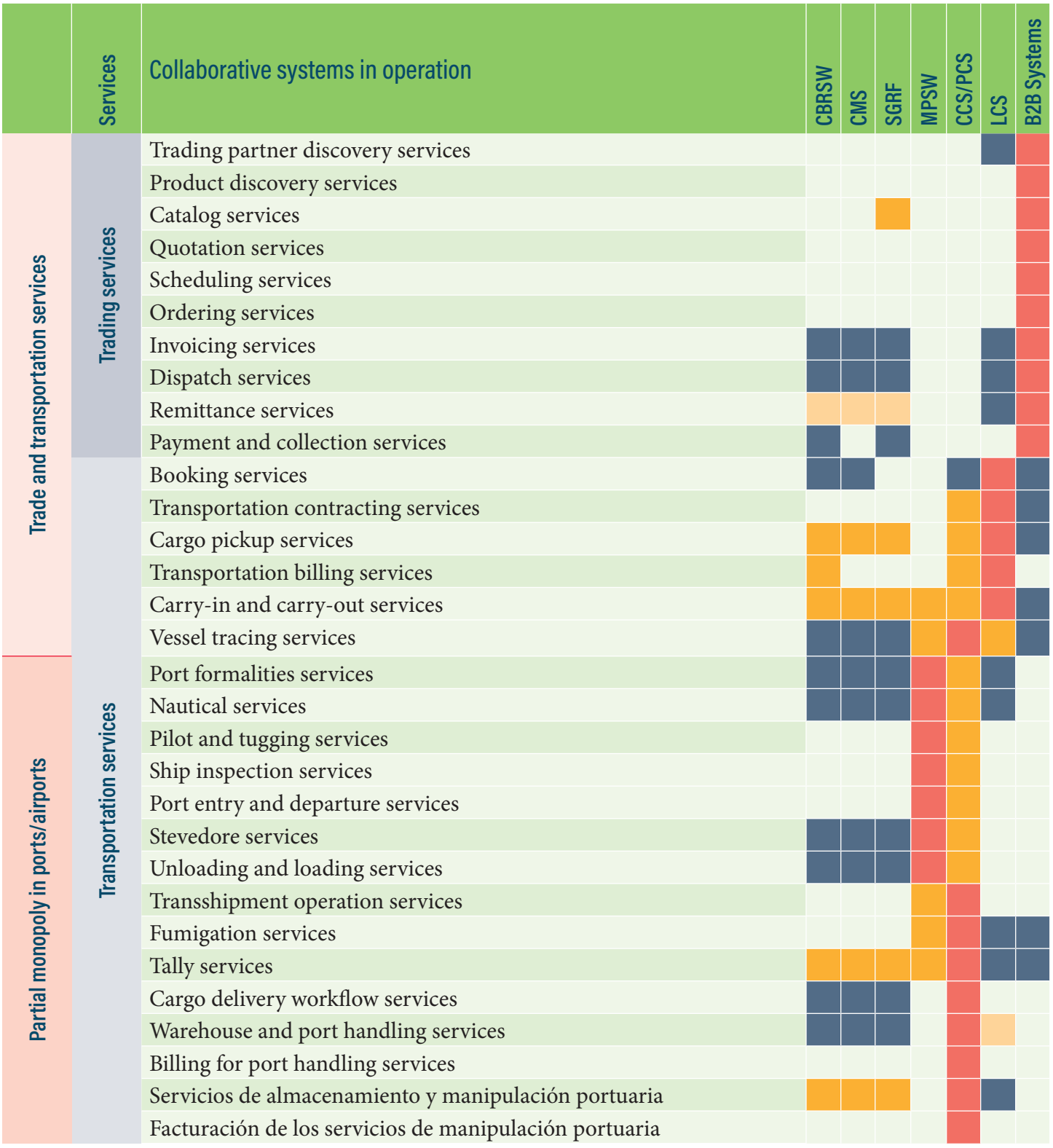
Putting together a services portfolio to cover trade, transportation, and regulatory requirements is an essential part of building up the network of systems, solutions, and services in a PCS.

An example of a port services taxonomy that highlights which systems are responsible for providing each service is shown in figures 6 and 7. This exercise makes it easier to identify and describe responsibility, accountability, and consultative and informative participation in a service from the point of view of both the system and stakeholders.

To this end, a responsibility assignment matrix (RAM, as described in PMI, 2010) or a responsible, accountable, consulted, and informed matrix (RACI, as described in Jacka and Keller, 2009) can be useful tools. The RACI matrix outlines how different roles (e.g., systems, stakeholders, people, and so forth) participate in a business process. It is especially useful for clarifying the roles and responsibilities in cross-functional projects and processes such as a PCSs. For example:

- Who is **responsible**? The IT systems that provide the service. One or more systems may be responsible for providing the specified service. When many systems are responsible, they can take a cooperative or fragmented approach. Where no system provides the service, it should be provided by one or more stakeholders.
- Who is **accountable**? Stakeholders that are directly involved in the service and that are entitled to use it.
- Who is **consulted**? IT systems and/or stakeholders that play a part in providing the service but are not providing the service by themselves.
- Who is **informed**? IT systems and/or stakeholders that are informed about the results of the service.

FIGURE 6. Services portfolio in ports (1)



CBRSW (Cross-border regulations single window), CMS (Customs management system), SGRCF (Cross-border regulation and control systems), MPSW (Maritime and port single window), CCS (Cargo community system), PCS (Port community system), LCS (Logistics collaborative systems), B2B (Business-to-business systems).

Service responsible system | Service accountable system | Service consulted system | Service informed system

Source: Adapted from WCO (2011)

FIGURE 7. Services portfolio in ports (2)

	Services	Collaborative systems in operation	CBRSW	CMS	SGRF	MPSW	CCS/PCS	LCS	B2B Systems
Monopolio gubernamental	Regulatory services	Conveyance reporting services							
		Advanced regulatory services							
		Goods declaration for export services							
		Goods declaration for import services							
		Transit declaration services							
		Goods release authorization services							
		Cargo reporting for loading/exit services							
		Cargo reporting for entry/discharge/storage services							
		Regulatory product certification services							
		Regulatory inspection services (phytosanitary/veterinary/sanitary)							
		Regulatory licensing services							
		Security screening services							

CBRSW (Cross-border regulations single window), CMS (Customs management system), SGRCF (Cross-border regulation and control systems), MPSW (Maritime and port single window), CCS (Cargo community system), PCS (Port community system), LCS (Logistics collaborative systems), B2B (Business-to-business systems).

Service responsible system | Service accountable system | Service consulted system | Service informed system

Source: Adapted from WCO (2011)

A PCS can provide information services for sea, port, and land operations. Table 5 compiles the services provided by the selected PCS solutions included in this study, showing which services are most in demand.

The ICT solutions used in developing a PCS should be adapted to local circumstances. They should also facilitate the integration of all stakeholders, adapting to user needs and maintaining security guarantees on information.

Technical interoperability is required to guarantee that participating entities' IT systems and services can connect and transmit to one another. Building on this, an intermediate IT platform connecting all services provided by individual stakeholders is also recommended. This IT platform would provide electronic messaging capabilities, communication between different applications, the orchestration of business processes, web hosting, common identity management, and identification and information security services.

An interoperability layer would need to be developed between existing systems and new IT solutions to ensure they can connect and exchange information through this common platform. This would act as a dispatcher and auditor for all electronic transactions, adapt communication requirements, and orchestrate different processes and services from information service providers.

TABLE 5. Potential PCS e-services

Servicios electrónicos	APCS	DAKOSY	DESTIN8	PORTBASE	PORTIC	PORTNET	AP+	VALENCIAPORTPCS
Bookings—sea transportation	X	X			X			X
Cargo declaration export/report				X	X			
Container release status/information	X					X		
Customs information	X	X	X	X	X		X	X
Dangerous goods information	X	X	X		X		X	X
Delivery instructions—land transportation			X					X
Discharge information				X	X			
Exit information	X			X	X			
Export load list	X		X					
Financial services						X		
Gate-in/gate-out report		X						X
Invoicing	X	X						
Loading and discharge information	X	X	X	X	X			X
Manifest—sea transportation		X						
Operations information—land transportation	X	X		X		X		X
Planning information—land transportation				X				
Port call management							X	X
Port/customs cargo manifest declaration		X					X	X
Ship (other information)				X				
Ship arrival/departure information	X	X	X		X	X		X
Shipping instructions	X	X			X	X	X	X
Track and trace—sea/rail/road				X		X	X	X
Transshipment information	X		X					
Transportation order	X	X			X		X	

6 PCS LEGAL FRAMEWORK

The legal framework of the PCS must contemplate regulations, legislation, and directives at the international and national levels. The PCS must ensure that all legal prerequisites for making different systems interoperable are met, especially when dealing with e-government services.

Legal interoperability might involve, among other factors, electronic signatures, handling contracts between participants, fixing IT glitches, information use, the security measures to be taken around information handling, and administrative staff recognizing electronic transactions.

7 THE ROLE OF PORT AUTHORITIES IN IMPLEMENTING A PCS

Traditionally, PCSs are developed and operate in ports where port authorities are organized under three models: landlord, regulator, and operator (for more, see World Bank, 2007). However, recent socio-economic changes and global strategic challenges have given rise to a new favorite: the community manager model.

Following privatization or liberalization programs in some countries, port authorities went being from logistics operators to community managers. Under this organizational model, port authorities have become limited to providing ancillary services that benefit the wider port community, such as waste handling and the provision of shore power to vessels. Technical and nautical services are still provided by public entities and in most cases by these port authorities themselves. Nevertheless, privatization has sometimes led to port authorities losing access to essential information, which affected has their ability to fulfill some of their objectives.

At the same time, numerous private operators making use of their own IT solutions leads to sizeable interoperability and coordination problems within port communities. Instead of a coordinated community of private actors, ports become numerous uncoordinated cargo terminals, each working differently and eventually generating substantial inefficiencies for SCPs and the whole supply chain.

PCSs and single window concepts are strategic tools for overcoming these challenges, harmonizing port procedures and processes and making them interoperable. Within this scenario, port users perceive all port activity—including all port terminals—as a single, integrated, coordinated unit, which eventually delivers the benefits sought without any major shortcomings. Port authorities act as community managers and ensure that the various port service providers are fully coordinated and efficiently interconnected.

Facilitating the port community is the keystone of the community manager role. Their work includes assisting members of the community in implementing safety, security, and environmental regulations; investing in hinterland networks outside the port area; operating an IT system for the benefit of the entire port community; leading the overall promotion and marketing programs for the port; and providing training and educational programs for the port community.

Regardless of the organizational model that port authorities use, their management practices may also differ substantially and influence their future strategic planning. Verhoeven's (2010) hypothetical typology of port authorities classifies them in three groups.

- **Conservator:** These are passive authorities that focus on being a good housekeeper and essentially implement the three traditional port authority functions passively and mechanistically at the local level.
- **Facilitator:** Those with an active role as mediators between economic and

social interests, many of which thus implement the community manager function. Facilitators also look beyond the port perimeter and try to engage in strategic regional partnerships with other vital transportation organizations and companies, such as intermodal terminals.

- **Entrepreneur**: These combine the main features of the facilitator with a more outspoken commercial attitude, also acting as investors, service providers, and consultants locally, regionally, and globally. This ambitious profile means there is a high risk of potential conflicts between their main functions.
- Conservator port authorities would likely show limited initiative when developing a PCS, whereas facilitator or entrepreneur authorities are eager to take up active leadership, development, and implementation roles. There are five key skills that facilitator or entrepreneur port authorities need to develop to drive ICT developments such as a PCS. These are:
- Mediate in commercial B2B relations with port operators (terminals, logistics operators, shipping agents etc.) and port customers (shipping lines or shippers) to define solutions that meet the whole port community's needs and engage them from the beginning of the project.
- Support the necessary investments to develop ICTs either directly—for entrepreneur port authorities—or indirectly—as co-investors, in the case of facilitator port authorities.
- Actively apply and enforce rules and regulations through cooperation with local, regional, and national regulatory agencies. Port authorities can (co-) design new regulations or rules to foster ICT tools that overcome different bottlenecks in the port logistics supply chain.
- Align efforts to develop ICT solutions for the whole port community.
- Initiate and lead training and education programs to increase the port community's awareness of the benefits and the proper implementation of ICT initiatives.

8 BEST PRACTICES IN PCS IMPLEMENTATION

This section presents a set of good practices which should be adopted to ensure that the the future PCS is implemented suitably for each port community. Once it has been decided to implement a PCS, these actions will help mitigate potential conflicts among stakeholders and to enhance understanding of the model to be used.

Set a benchmark point

A benchmark point determines where all stakeholders stand in terms of information and processes at the beginning of the project, which enables benefits to be measured and quantified as the project progresses. Establishing a performance monitoring tool would also help measure the impact of the initiatives taken throughout the PCS project cycle. The leadership team can draw on these results to make more accurate decisions, thus increasing the chances of successful outcomes.

Use the BRM approach to design the relational model for the PCS

A relational model enables different relationship types of relationships between stakeholders in the port supply chain and the related information management processes to be identified. In this regard, business relationship management (BRM) is a useful approach. BRM seeks to provide a complete and holistic model of business relationships and value over time, to make the various aspects of business relationships both explicit and measurable.

The development of a PCS requires a party or a consortium to take the leadership role. At the same time, neutrality and openness are key factors for ensuring support from the whole port community, particularly when trust between stakeholders and with the PCS operator is critical. A relational model helps identify SCPs who are a logical fit for PCS leadership and governance roles. This is not restricted to operational and regulatory players but also includes institutional, financial, technical, and infrastructure stakeholders. A typical example of a high-level relational PCS model is shown below (figure 8), referring to the design of Valenciaport's PCS.

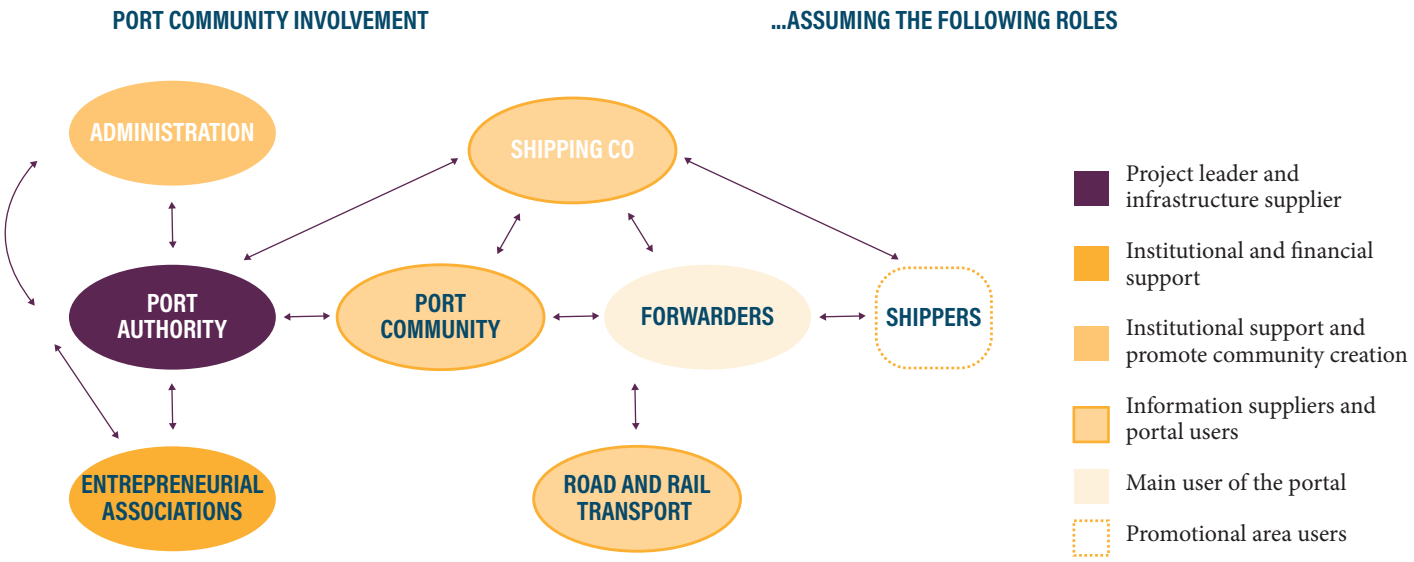
Another important step in PCS design is the definition of a relational model for the network of systems and solutions that make up a PCS. In modern ports, a PCS can take the form of an interconnected network of systems and solutions for electronic communications between SCPs.

Build a Simulator

A simulator is of substantial value in supporting decision-making and demonstrating the anticipated benefits that a PCS can bring to the port community. It simulates information, documentation, and data exchange among SCPs in a real-life scenario, revealing cost and time savings along with opportunities for optimizing and making

better use of existing infrastructure and resources. The results of the simulation can then be compared with current performances, end results can be outlined, and the expected benefits that a PCS will bring the port community can be specified.

FIGURE 8. High-level relational model—Valenciaportpcs.net.



Source: Valencia Port Authority

Simulation can also test a range of solutions and operational changes and lay out the associated effects so as to minimize the risks and maximize the benefits of different implementation scenarios and strategies. The simulator can test the effects of possible alternatives cost-effectively and support the process of deciding on which PCS solution to implement. By treating the simulator as a "living decision support tool," these benefits can still be realized during feature roll-out and once the PCS is fully operational.

The simulator should be developed using a cost model, which would shed light on the expected distribution of benefits among SCPs—a major concern in the private sector. Finally, it can also be used as a demonstration tool that is provided free to the port community as part of implementing the PCS. This would enable individuals to test the simulator themselves and even model their own data to establish the benefits their organization can expect.

Start with case studies

While a simulator can deliver reliable information, this alone may not be enough to persuade stakeholders to commit to a PCS. Case studies can provide real-life examples and mitigate lingering concerns by focusing on different parts of the supply chain or specific types of cargoes, thereby providing insights into the practical benefits of PCS solutions.

The clearly articulated benefits outlined in case studies can lay the groundwork for education and promotional campaigns. More importantly, case studies can help mit-

igate "building the port community"5 issues, as they involve a limited number of SCPs. Case studies should be carried out with the buy-in of a limited number of enthusiastic stakeholders who can then help promote the end results for wider consumption.

Two alternatives are identified here:

- Niche portals. These are mini-PCS solutions that focus on specific parts of the supply chain such as rail movements. Niche portals can be developed using the same principles as a fully functional PCS to maximize their benefits. Incumbent SCPs come to understand these, which will put any concerns to bed, and can use them to attract other stakeholders willing to contribute to developing a scalable PCS.
- Gold supply chains. These are the movement of specific products via containers through one or more ports in the country. They require the active collaboration of a relatively limited number of relevant SCPs, such as a terminal operator, a shipping line, or a freight forwarder. Their success will eventually attract the interest of additional SCPs.

Build the community

A PCS is not an IT project, but rather a change management project. The key is to build a true community of SCPs where everyone recognizes that the benefits of working together toward a common goal are greater than working separately. This can only be achieved through regular engagement with the community of PCS stakeholders. In fact, the human element of growing trust and overcoming suspicion by networking and building friendships without condoning anticompetitive behaviors is likely the most decisive factor in building a successful PCS.

Education and training are appropriate strategies for achieving this engagement. SCPs must be fully informed about what a PCS is, how it works, and what it brings to the community. Organizing seminars with presentations by representatives from successful overseas PCSs and successful industry clusters should be a priority. International conferences would also be useful.

Likewise, a dedicated website for promoting related material and initiatives can act as a reference point for the port community. The simulator could be publicly available on this site so that each SCP can explore the effects and benefits of a PCS. This would enable sophisticated, targeted consultative information to be delivered to each SCP without compromising data confidentiality. Building the community is largely dependent on a stable PCS leadership team, which needs to create an environment of trust and coax SCPs to actively participate. The team must be held in high regard by the port community and be willing to address stakeholders' concerns.

Finally, a strong community or cluster is a powerful factor when lobbying government stakeholders for support. It is far more effective to discuss issues with other sectors and, particularly, the government, as a unified port community than as a

5 However, this does not imply that efforts to build port communities should be abandoned or overlooked. On the contrary, these should be continuous and work in parallel with the development of case studies.

fragmented port system where stakeholders are each fighting for their own corner without acknowledging the fact that they are part of a single solution. After all, the client or user cares very little about where the problem lies. What counts most is the final quality of the service the port community provides.

Seek alliances with "power players"

Some stakeholders in a port community are in a better powerful position to influence or "force" to the adoption of a PCS. They provide essential support and, most importantly, eliminate the risk of developing a PCS that no-one will use. Developing strong alliances with such power players will effectively make a PCS mandatory for the port community.

A good example of a power player is the entity responsible for managing the port. Without effective commitment and buy-in from the port authority/port concessionaire, a successful PCS becomes virtually impossible. The same applies to the port users such as freight forwarders, haulers and shipping lines. Identifying stakeholders who are strong enough bring others on board with the PCS project is essential.

Build a governance consortium

Another key step is seeking partners for a potential governance consortium and/or steering committees for pilot projects. Three actions should be considered while building this consortium:

- Create a code of conduct or charter to direct the behavior of consortium members.
- Develop strategies to deal with potential partners who are not well aligned with the PCS vision, such as companies who profit from the inefficiencies of the status quo. All parties should be encouraged to become part of the broader community.
- Make the pilot project steering committee open to national membership even if the project is local.

Foster relationships with incumbent IT providers

Foster and maintain good relationships with incumbent IT providers. A PCS must work with current IT platforms and cooperate with these to develop win-win arrangements wherever possible.

A well-organized and planned approach to developing a PCS may spur incumbent IT providers to change direction and develop a fully functional PCS offering. This would be a welcome outcome.

With this in mind, PCS stakeholders should agree on the following:

- The fundamental requirements of what makes a PCS.
- The gaps that are not addressed by the current IT provider's offerings and whether there is sufficient motivation for the PCS owner to fill in these gaps.

- Potential conflicts of interest and areas where IT providers may not be motivated to collect data, share data, or provide services.
- The technical limitations of the current IT provider's systems in adapting to future requirements.

Develop cloud- and/or web-based applications

SMEs do not have strong incentives or the required funds to invest in IT solutions and thus are heavily dependent on manual transactions. This must change if a port community wants to move toward a paperless supply chain. The development of cloud- and/or web-based applications are an ideal strategy in achieving this. Applications will enable each SCP to carry out all essential transactions electronically. SCPs will not have to invest in IT platforms but instead pay just for the services they use via transaction fees and/or an annual fee.

The cost of developing such applications can be relatively low and easily recovered through usage fees. Applications could be lightweight and provide specific subfunctions yet still be fully integrated with the full PCS system. Applications for SMEs would not need to have as many technical features as those used by companies handling large volumes of trade. Likewise, these applications could even be packaged as mobile apps.

ANNEX I—INTERNATIONAL PCS CASE STUDIES

8 Valenciaportpcs.net—Port of Valencia/Spain[6]

8.1.1 Description

Valenciaport comprises three ports managed by the Valencia Port Authority (PAV): Valencia, Sagunto, and Gandía. This combination makes it Spain's leading Mediterranean port in terms of commercial traffic—basically containerized cargo—because of its area of influence and an extensive network connecting it to major ports around the world. Valenciaport is a tight-knit port community made up of all stakeholders in the three ports and relies on innovative elements like the ValenciaportPCS.

One of the major challenges faced during the creation of ValenciaportPCS was determining who would pay for the system and who would benefit from it. During the early stages (around 2001), when traffic volumes were lower (in 2001, container throughput was 1.5 million TEUs, more than 60% lower than today), identifying the benefits of the PCS was difficult, which made it harder to develop a successful solution. It was the PAV that decided to take the lead and build a PCS as part of its strategic development plan to achieve a modern digital port. It put forward the start-up capital and fronted initial operating costs to do so.

Today, the port community is convinced of its benefits and is firmly committed to its ongoing success. A key factor in the success of this PCS solution has been the perception that it is a fair, neutral tool with a clear cost-benefit balance. The PAV is now exploring an ongoing sustainability model where 50% of the cost is borne by the port authority—based on the benefits to port infrastructure and competitiveness—and 50% by the port community stakeholders.

8.1.2 Ownership

The IT platform is fully owned and operated by the PAV. Technical, commercial, operational, and development aspects are outsourced to specialized companies through public tenders. The platform has a PCS manager inside the port authority structure who is responsible for organizing, running, and managing the PCS and coordinating and supervising the different teams and activities.

8.1.3 Financial Model

The goal of the PCS is to add value to and save money on port operations and logistics and transportation chains—in other words, it is not a for-profit model. Consequently, PCS fees are prorated so that companies benefiting more from the system pay more into it.

6 This report presents more detailed information regarding the ValenciaportPCS than other PCSs because the consultant has worked for this port since 2014.

FIGURE 9. Informative and transactional services for each user

		Servicios/Usuarios	Transitarios exportadores/ importadores (+despach. aduanas)	Compañías navieras/ transportistas	Transportistas terrestres	Terminales	Depósitos	APV/Otras autoridades	
Transaccionales	Servicios de comunidad portuaria	Transporte terrestre (transporte ferroviario)	X	X	X	X	X	X	Ingresos por servicios para la comunidad portuaria comunidad portuaria
		Reservas de carga Instrucciones de embarque	X	X					
		Instrucciones para las terminales		X		X		X	
	Servicios de ventanilla única	Solicitud de escala Notificación de mercancías peligrosas Declaración de mercancías		X		X		X	Ingresos por serv. de la APV
Informativos	Servicios con valor agregado	Rastreo y localización integral	X	X	X	X	X	X	
		Información aduanera	X	X	X	X	X	X	
		Datos del estado de la aduana	X	X	X	X			
		Informes de IVA		X		X			
		Control aduanero automático p/exportación		X		X		X	
		Cronogramas	X	X	X	X	X	X	
		Mensajes a otras autoridades	X						
		Control de calidad e informe	X	X	X	X	X	X	
	Servicios profesionales	Integraciones internas	X	X	X	X	X		Ingresos por serv. profes.

Source: Valencia Port Authority

According to the PCS revenue policy, fees paid by users of valenciaportpcs.net cover the system's operating costs but do not amortize the investment made to build the system. The PCS financial model thus classifies its services into transactional services, information services, and professional services.

- Transactional services include both port community services and single window services and are offered on a subscription basis for an official fee.
- Information services are value-added services offered free of charge to users of the transactional services. Information services enable the port community to complete transactional services more cost-effectively, providing added value to the port community.

- Professional services are provided by the port community and IT experts on request to help users with in-house system integrations.

The tariff for a supply chain participant depends on the organization's business role in the port community and the number of transactions it makes. There is also a first-time setup fee of €350. This approach complies with the objective that the companies that benefit most from using the system pay more for using it. It is important to note that the PAV also contributes financially to the PCS as it is a beneficiary of some transactional services7 while also benefiting from the more efficient use of the port's public real estate and infrastructure.

TABLE 6. Tariffs for container terminals

TEUs I/E Full	>300,000	>50,000	<50,000
Monthly rate	€2,500	€1,800	€150

TABLE 7. Tariffs for shipping agents and sea carriers

TEUs I/E Full	>250,000	>150,000	>40,000	>10,000	>5,000	<5,000
Monthly rate	€1,800	€1,200	€800	€600	€350	€1/TEU

TABLE 8. Tariffs for freight forwarders

Annual transport TEUs	>18,000	>5,000	>2,000	>540	<540
Monthly rate	€200	€120	€80	€45	€1/TEU

TABLE 9. Tariffs for inland carriers

Annual transport order	>18,000	> 6,000	> 540	<540
Monthly rate	€200	€90	€45	€1/TEU

TABLE 10. Tariffs for container depots

Annual transport order	>12,000	>540	<540
Monthly rate	€150	€45	€1/TEU

8.1.4 Main Services

Valenciaport's primary services are classified as sea, port, land, and general/other

7 For example, submission of dangerous goods manifests and movements inside the port, submission of the port and customs manifests through a single window approach, services for complying with the vessel port call formalities through an Integrated Port Call Procedure, port traffic management and port automatic gate control, etc.

services.

Sea

- Vessel schedules (departures and arrivals)
- Booking
- Shipping instructions

Port

- Port call management
- Dangerous goods management
- Port/customs cargo manifest declaration
- Paperless customs clearance for exports
- Automated customs clearance for imports
- Customs information
- Terminal instructions (loading/discharge)

Land

- Inland transportation (unified transportation document, integrated with gate-in and gate-out movements and transportation details)
- Rail

General services/other

- Tracking and tracing
- Quality control

8.1.5 Users/Clients

Valenciaport's main users and clients are:

- shipping agencies, which may be local offices or agents of the shipping lines
- those liable for the goods and containers at different steps in the supply chain—mainly freight forwarders, shipping agencies, and rail operators, but also shippers and receivers of the goods
- port terminals—mainly container and RO-RO terminals, but also bulk terminals for specific services
- empty container parks
- container freight stations
- port authority
- customs and goods inspection agencies

The PCS offers e-commerce solutions to port community members, thereby facilitating the passage of goods through the ports managed by PAV. These solutions add clear, tangible value for shippers.

The valenciaportpcs.net platform offers companies working in the Port of Valencia further ways of providing value-added operational services to their clients. The cost of using valenciaportpcs.net is minimal compared with the benefits it brings, and users are guaranteed the most advanced, secure technology for transmitting and using data electronically.

8.1.6 Reported Benefits

Tables 11 to 15 show the savings that various SCPs made. Each of these was calculated from estimates of hours saved, which was then translated into Euros using a base salary, considering tariff charges. These calculations depend on the volume of traffic.

Savings for container terminals

TABLE 11. Savings using the portal for a container terminal with a volume of 200,000 TEUs per year, 30% of which transshipments.

Services	TEUs	Hours saved				
Release/admittance orders	140,000	11,667				
Instructions to terminals	180,000	15,000				
Savings in documentation: generation, transmission correction,...	200,000	1,667				
Tracking, customs info DDGG, LSPa...	200,000	6,667				
Reduction of errors [1] (% reduction in inefficient movements)	1.76%	Savings/ year	Cost/year	Savings/ TEU	Cost/ TEU	Profit/TEU
Time saved (in hours) [2]	35,000	€499,087		€2.50		
Monthly cost	€1,800		€21,600		€0.11	
Total		€499,087	€21,500	€2.50	€0.11	€2.39

(1) Assumptions: 5% of the documents contain errors and 20% of the incorrect documents involve extra movements.
(2) Estimated cost of €25,154 per person per year. 1,764 hours per year at €14.26 per hour.

The above calculation for a medium-sized terminal represents a benefit of €2.39 per full TEU moved for a container terminal and annual savings of around €0.5 million (for a medium-sized terminal handling 200,000 TEU/year).

Savings for shipping agents and carriers

TABLE 12. Savings on operating using the portal for a shipping agent with a volume of 20,000 TEUs per year, 20% of which are transshipments and 40% of which are exports

Services	TEUs	Hours saved				
Land transportation orders	16,000	800				
Instructions to terminals (TEUs export) LSPa	12,000	2,000				
Shipping instructions and bookings(1)	4,000	667				
Savings in documentation: generation, transmission, correction...(2)	50%	Savings/ year	Cost/year	Savings/ TEU	Cost/ TEU	Profit/TEU
Time saved (in hours) (3)	3,467	€49,433		€2.47		
Monthly cost	€800		€9,600		€0.48	
Total		€499,087	€9,600	€2.47	€0.48	€1.99

(1) Assuming 2 TEUs per shipping instruction.
(2) Estimated cost of €25,154 per person per year. 1,764 hours per year at €14.26 per hour.
(3) Documentation cost estimate of €50 per B/L (average discount of €10).

In this case, shipping agencies and carriers' estimated savings are around €2/TEU transported—an annual saving of almost around €40,000 for a medium-sized shipping agency. It is important to note that shipping agencies in Spain play a more active role in the road and rail transportation segment delivering door-to-door services (approximately 50% of road segments and 80% of rail segments are arranged directly by shipping line offices and agencies).

Savings for freight forwarders

TABLE 13. Savings using the portal for a freight forwarder with a volume of 10,000 TEUs per year, 50% of which are exports

Services	TEUs	Hours saved	Discounts			
Land transportation orders	9,000	450				
Instructions to terminals (TEUs export) LSPa	2,500	208	25,000			
Shipping instructions and bookings(1)	10,000	167				
Savings in documentation: generation, transmission, correction...(2)	50%	Savings/ year	Cost/year	Savings/ TEU	Cost/ TEU	Profit/TEU
Time saved (in hours) (3)	3,467	€36,764		€3.67		
Monthly cost	€800		€1,440		€0.14	
Total		€36,764	€1,440	€3.67	€0.14	€3.53

(1) Assuming 2 TEUs per shipping instruction.
(2) Estimated cost of €25,154 per person per year. 1,764 hours per year at €14.26 per hour.
(3) Documentation cost estimate of €50 per B/L (average discount of €10).

In this case, freight forwarders' savings are estimated at around €3.53/TEU handled with annual savings of almost around €35,000 for a medium-sized freight forwarder.

Savings for inland (road) carriers

TABLE 14. Savings using the portal for an inland (road) carrier with a volume of 7,000 TEUs per year

Services	TEUs	Hours saved				
Land transportation orders	6,790	340				
Tracking and customs information	7,500	117				
Savings in documentation: generation, transmission, correction...	50%	Savings/ year	Cost/ year	Savings/ TEU	Cost/ TEU	Profit/TEU
Time saved (in hours) (1)	456	€6,505		€0.93		
Monthly cost	€90		€1,080		€0.15	
Total		€6,505	€1,080	€0.93	€0.15	€0.78

(1) Estimated cost of €25,154 per person per year. 1,764 hours per year at €14.26 per hour.

In this case, inland carriers' savings are estimated to be around €0.78/TEU handled with annual savings of almost around €6,000 for a medium-sized road hauler. It is important to mention that this estimation is based only on savings on office work and paper handling. The overall benefits of PCSs for road haulers are much higher, as they reduce errors, wasted journeys, and waiting times for picking up and delivering containers. They also enable automatic gate systems at ports, terminals, and empty container parks.

Savings for empty container parks (depots)

TABLE 15. Savings using the portal for an empty container park with a volume of 12,000 TEUs per year.

Services	TEUs	Hours saved				
Land transportation orders	10,800	1,800				
Tracking and customs information	7,000	23				
Savings in documentation: genera-tion, transmission, correction...	50%	Savings/ year	Cost/ year	Savings/ TEU	Cost/ TEU	Profit/TEU
Time saved (in hours) (1)	1,823	€26,000		€2.16		
Monthly cost	€150		€1,800		€0.15	
Total		€26,000	€1,800	€2.16	€0.15	€2.01

(1) Assumptions: 5% of the documents contain errors and 20% of the incorrect documents involve extra movements.
(2) Estimated cost of €25,154 per person per year. 1,764 hours per year at €14.26 per hour

Total savings

In order to make a rough conservative estimate of total savings per year, it is assumed that each of the stakeholders that handle TEUs save approximately €2/TEU. The Port of Valencia moved 4.8 million TEUs in 2017 but considering only full import and export containers (2.11 million TEUs in 2017), the annual benefit that the PCS provides the port community can be estimated by the following formula:

€2/TEU savings x 2,110,000 full import-export TEUS x (1 shipping agency + 1 empty container park + 1 container terminal operator + 1 inland carrier + 1 freight forwarder) = €21,100,000/year overall savings.

The savings made by container terminals and shipping agencies for handling transshipped containers are also taken into account. Even if the savings for each of these are estimated at €0.50 per TEU, in combination, they enabled the Port of Valencia to save an additional €1.9 million per year for handling transshipments, given that it handled around 1.90 million TEUs.

ValenciaportPCS provides the entire port community increased efficiency and competitiveness valued at more than €23 million per year. Even if the estimated development costs for the ValenciaportPCS (around €10 million) and the annual operative costs (around €1.6 million) are taken into account, there would be return on investment in less than one year.

8.2 Antwerp Port Community System (APCS)

8.2.1 Description

APCS was formed in June 2011 by the Antwerp Port Authority and Alfaport Antwerpen, which is a federation of five industry associations, including the Antwerp Stevedores' Association, the Antwerp Shipping Federation, the Royal Belgian Shipowners' Association, the Royal Association of Traffic Flow Controllers, and the Antwerp Freight Forwarding Logistics and Works Agents Association.

8.2.2 Ownership

Owned by the Antwerp Port Authority and Alfaport Antwerpen, APCS is managed by a steering committee with public and private sector representatives from the port community. The Descartes Systems Group (formerly Porthus) is a strategic partner that operates and manages the clearing center. This implies that Descartes is the preferred supplier when the APCS Steering Committee decides to work with a third party to design, develop, implement, or support APCS functionalities. As a result, many of the applications on this site belong to Descartes and other providers step in whenever Descartes has no solution for a specific desired functionality.

8.2.3 Financial Model

No information is publicly available on the fees for the APCS platform.

8.2.4 Main Services

Like ValenciaportPCS, services offered cover sea, port, and land, but there are also some barge-related services.

8.2.5 Users/Clients

There is no definitive list of users, but information about the services can be used to infer some information about them. The availability of similar services through other PCS platforms such as Portbase in Rotterdam imply that the user base is comparable.

8.2.6 Reported Benefits

The APCS lists direct benefits of its system, including standardization, confidentiality, and security. Since the PCS works on EDIFACT UN standards, messages are accessible and can be exchanged throughout the world.

Private companies, customs, and the port authority connect to the system using secure unique identifiers. They can then send and receive electronic messages to other SCPs and government agencies through the network. The platform over which the messages are distributed acts as a trusted third party, guaranteeing data confidentiality. The network supports EDI and XML versions of standard electronic messages and supports other document formats including scans.

It is maintained by the port authority through a partnership with the Descartes Systems Group, which operates the data center and connects it to the Descartes Global Logistics Network. Users connect to the data center via public internet or can opt for a dedicated network connection (via a leased line). APCS's security mechanisms include identification numbers, passwords, and encryption technology.

All information entrusted by a user to the data center remains the user's property. The system guarantees that only the sender and recipient of a message have access to the content unless the user has explicitly consented to a copy of the data being sent to other parties. Messages can be encrypted if necessary.

The APCS website lists the following services and benefits of its data center:

- transmission of standardized EDIFACT or XML messages
- conversion of message formats
- business rules and routings
- supporting network for all applications that exchange electronic messages
- interconnections to an unlimited list of international networks worldwide
- optional archiving of all messages for a period of at least 10 years
- tracking and tracing sent and received messages; guaranteed delivery
- immediate access to the Descartes Global Logistics Network
- authentication of sender and recipient

8.3 Portbase—Port of Rotterdam and Amsterdam

8.3.1 Description

Portbase was set up as a result of a merger between the Port of Rotterdam's Infolink and Portnet, a system implemented by the Port of Amsterdam in 2009. Its goal, much like those discussed previously, is to simplify the logistics chains in Rotterdam and Amsterdam and to make them as competitive as possible by creating a one-stop shop for information exchange.

Portbase is a not-for-profit organization and is considered a neutral, reliable entity for logistics information exchange.

8.3.2 Ownership

The Port of Rotterdam Authority and Port of Amsterdam are both shareholders, as are members of the business community, all of which are represented on the supervisory board. The board is responsible for assessing Portbase's progress and operations and supervising the development of the port community system. The advisory board—which was set up by the port employers' organization Deltalinqs—is made up of various representatives from the port business community.

Portbase, as a not-for-profit organization, has three main departments:

- **Strategy and administration** brings together strategic responsibilities (enterprise architecture, strategy and business development, quality and security) and regular staff duties (HR, office management, finance and control).
- **IT delivery** develops and tests new services (project delivery) and manages and maintains existing services and the platform (service delivery).
- **Marketing and sales** handles service portfolio management, sales, communications, and marketing.

8.3.3 Financial Model

No information is publicly available about fees for the Portbase platform.

8.3.4 Main Services

The services offered by Portbase are wide-reaching because road and rail planning services have been integrated with the platform. Much like APCS, it also provides some planning services for barges and vessel-related services connecting shipping agents, shipping lines, customs, harbor masters, and port authorities. Many activities can be scheduled in advance through the system.

Import and export cargo management services serve the needs of agents, importers, shipping lines, shipping agents, and forwarders. Inland transportation services involve both road haulers and rail lines in the platform, making the overall list of clients and users a long one.

8.3.5 Users/Clients

Users include almost all participants in the supply chain; however, their degree of involvement varies greatly. Clients include agents, inspection stations, barge operators, shipping companies, shipbrokers, rail infrastructure operators, customs, rail operators, empty container depots, traction suppliers, forwarders, terminals, exporters, inspection authorities, port authorities, road haulers, and importers.

8.3.6 Reported Benefits

The Portbase PCS states that 10,000 users access the range of services it provides and send over 60 million electronic messages per year. One of the major benefits associated with Portbase is how reusable the data sent through it is, which makes SCPs more efficient.

Portbase states its main advantages as being:

- greater efficiency
- lower costs
- better service provision
- better planning
- quicker turnaround times
- fewer errors
- optimal re-use of information
- 24/7 availability

8.4 PORTIC—Port of Barcelona

8.4.1 Description

PORTIC is the PCS that has been implemented at the Port of Barcelona. Its declared mission is to increase competitiveness, innovation, and to remain neutrality.

8.4.2 Ownership

According to its mission, PORTIC is dedicated to maintaining its neutrality. It works as a traded company with shareholders. PORTIC's board of directors is made up of the following shareholders:

- Port Authority of Barcelona
- La Caixa Bank
- Sabadell Atlántico Bank
- Official Chamber of Commerce, Industry, and Navigation of Barcelona

8.4.3 Financial Model

No information is publicly available on the fees for the PORTIC platform.

8.4.4 Main Services

The services provided by PORTIC include many of those covered in the previous examples of PCSs.

8.4.5 Users/Clients

Users include forwarding agents, customs agents, freight haulers, shipping agents, terminals, and stevedores.

Forwarding agents benefit from services such as booking and shipping instructions, which communicate with shipping agents via the INTTRA and GT Nexus platforms (the PCS is integrated with these), and from services that provide confirmation- and clearance-related communication with customs agents.

Freight haulers, on the other hand, make use of transportation orders, arrival and departure notifications, and transportation services. Shipping agents use most services, including booking, consignment updates, transportation orders, and customs services.

8.4.6 Benefits

PORTIC highlights benefits such as efficiency, cuts in operations and technology costs, and enhanced security.

The system's efficiency is related to time saved on information and data exchange, reductions in errors, and the elimination of double data entry.

The operational cost-savings are explained by the staff time and energy saved on data entry tasks, phone calls, or emails.

The technology-related cost-savings reportedly come from the platform's integration options, which include numerous exchange formats. A legal framework prevents unauthorized access to all data exchanged via the platform and ensures that it is secure.

8.5 Portnet—Port of Singapore

8.5.1 Description

Created in 2000, Portnet is a privately owned PCS platform operating at the Port of Singapore, one of the largest container ports in the world. PortStrategy (2012) estimated that Portnet yielded savings of up to $80 million to the entire port community over a three-year period.

8.5.2 Ownership

Portnet.com is a subsidiary of PSA, a port group with operations throughout the globe, particularly in Singapore and Antwerp. PSA was the Port Authority of Singapore before being incorporated in 1997 and becoming the investment-holding company for PSA businesses worldwide in 2003.

8.5.3 Financial Model

No information is publicly available on the fees for the Portnet platform.

8.5.4 Main Services

Portnet's key features suggest that the services it offers are similar to those of the other PCSs analyzed here, namely:

- online ordering of port services
- vessel management
- stevedoring services and information
- service and vessels declaration
- berth application
- yard crane handling services
- pilots, tugs, and water boat services
- reefer monitoring services
- labeling/monitoring/fumigation services for dangerous goods cargoes
- on-dock depot facilities
- online billing functions which integrate with customers' in-house systems
- financial electronic data interchange (FEDI) of bills
- facilitating rebilling processes by shipping lines
- online viewing of Portnet charges

Portnet supports the seamless flow of information for container shipment and facilitates interactions and the synchronization of activities/information across multiple parties, including:

haulers' job lists and subcontract functions

- government permit applications
- electronic delivery order (EDO) and delivery processing
- container store and release order
- support system-to-system integration

The platform provides updated, real-time information on the fulfillment of services for end-to-end control of the entire supply chain. This includes:

- facilitating efficient and effective discharging/loading of containers upon berthing
- guiding trucks clearing the PSA's "flow-through gates"
- preventing over-stowage during planning
- implementing the proactive exception management tool

It also provides real-time tracking and consolidated information on-demand for query and analysis purposes, such as:

- container status, including arrival and discharge timings
- vessel status, including current location, and changes in berthing details
- detailed schedules: shipping, berthing, yard crane
- ship planning data
- reefer container temperatures
- dangerous goods services inquiry

8.5.5 Users/Clients

Shipping lines, shippers and forwarders, maritime service providers, truckers, road haulers, and the port authority are involved directly in Portnet. A group of solutions for different user groups is also included under the PSA umbrella, through products such as EZShip, TradeNet, and Cargo D2D. These reach a broader market and manage information that is integrated with the PCS.

8.5.6 Reported Benefits

Portnet's list of benefits is somewhat similar to those offered by the other PCSs described in this section.

- Portnet streamlines documentation and business processes for the port community.
- Its single-view, consolidated platform improves efficiency by eliminating repetitive data entry and processing and transcription errors.
- It simplifies processes through integration with government and port authority systems and port users' individual systems.

8.6 AP+ Port of Marseille Fos

8.6.1 Description

The Marseille Gyptis Internationals (MGI) cargo community system was established in 1989 with the goal of managing the flow of goods through the port. Initially set up in the port of Marseille Fos, the shareholders—who are represented by the port trade associations—are also the primary users. Protis, the original system used at Marseille Fos, was replaced by AP+ in September 2005. The goal of AP+ is to unify private and public community professionals to handle all logistics processes related to the export and import of goods

8.6.2 Ownership

As mentioned above, AP+ is a cargo community system that is based on a public–private partnership.

8.6.3 Financial Model

No information is publicly available on the fees for the AP+ platform.

8.6.4 Users/Clients

The list of users that AP+ provides includes all member of the public and private port community. The following list summarizes these.

Public authorities:

- customs
- port authorities
- other authorities

Private businesses:

- forwarding agents
- shipping agents/shipowners
- terminal operators
- rail, waterway, and road carriers
- container freight depots

AP+ is interfaced with the private systems of:

- ship owners/shipping agents (for booking exports and import announcements)
- forwarding agents (for goods file and tracing)
- container terminals (for receiving, loading, unloading, goods announcements, physical and customs statuses, and pre- and postrouting for large-scale barge and rail transportation)

AP+ is interfaced with the following public systems:

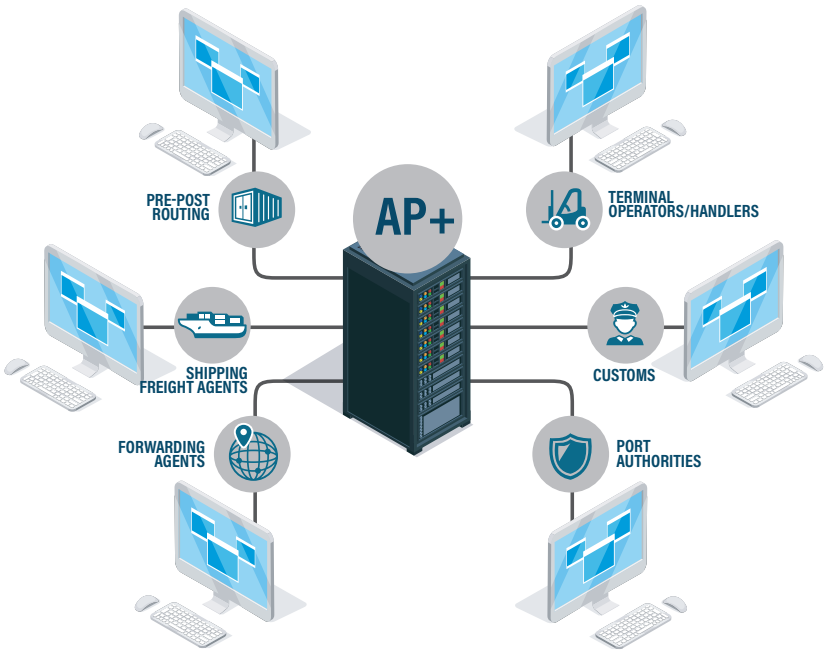
- all customs systems
- port authorities (port calls management system, statistics system, dangerous goods systems)

Benefits

The list of advantages of the AP+ cargo community system includes the following:

- **Process simplification: decrease in the number of processes and documents exchanged.**
- **Dematerialization of documents: faster treatment of vast amounts of information.**
- **Automation: reductions in data-processing times.**
- **Integration: elimination of redundant data entries thanks to system interfaces; more reliable data acquisition.**
- **Anticipation: decrease in the global cycle time.**
-
-

FIGURE 10. AP+ users



Source: gyptis.fr.

8.7 DAKOSY—Port of Hamburg

8.7.1 Description

The development of DAKOSY began on July 1, 1983, when a harbor order was sent electronically for the first time from a haulage company to the Hamburger Hafen und Logistik AG via the DAKOSY data center. As an early adopter of technology, DAKOSY positioned itself at the center of communication exchange, one of the primary reasons for its success.

As technology began to improve, more members of the community began to take part in the system, which eventually led to the DAKOSY platform becoming the one-stop shop for the Port of Hamburg.

Today, this central role has meant that all logistics companies involved in the import and export of goods require DAKOSY for data communications. Over 2,200 customers use the platform, including haulage companies, line agents/shipowners, rail transportation companies, trucking companies, and feeders, along with public entities such as customs, harbor police, and fire services.

The Port of Hamburg is a paperless port: all companies and authorities involved in export, import, and transit processes can handle their transportation processes rapidly with electronic assistance from DAKOSY's B2B services and applications.

8.7.2 Ownership

DAKOSY AG is headquartered in Hamburg and has a capital stock of €1.53 million, which is held by the Seaport Industry of Hamburg. The corporate structure of the software corporation consists of three branches:

- DIHS—DAKOSY Interessengemeinschaft Hamburger Spediteure GmbH (consortium of Hamburg freight forwarders using DAKOSY)
- DHU—Gesellschaft Hamburger Umschlagbetriebe mbH (Port of Hamburg handling companies)
- DIHLA—DAKOSY Interessengemeinschaft Hamburger Linienagenten GmbH (consortium of Hamburg liner agents using DAKOSY)

These three groups also make up the majority of the system's users and are responsible for promoting and maintaining the platform.

Since the beginning of 2007, Bremen-based CargoSoft GmbH also belongs to DAKOSY.

8.7.3 Financial Model

No information is publicly available on the fees for the DAKOSY platform.

8.7.4 Main Services

Compared to the other PCS services described above, the DAKOSY PCS offers many more rail-related services due to its integration with rail-side operators.

8.7.5 Users/Clients

DAKOSY's customer base has been growing steadily. More than 2,000 companies and institutions now use DAKOSY for their electronic business transactions. These companies include freight forwarders, shipping companies, liner agents, carriers, various authorities (customs, harbor police, and so on), world-famous trading houses, branded companies, and industrial enterprises.

8.7.6 Reported Benefits

DAKOSY lists benefits that are somewhat like the benefits previously covered by the other PCSs in this section including less duplication, enhanced integration with port users' systems, and fewer errors.

8.8 Destin8—Port of Felixstowe

8.8.1 Description

The Port of Felixstowe is Britain's biggest and busiest container port and one of Europe's largest. Felixstowe was another early adopter of new technology, beginning in 1981 with the development of FCP80 (Felixstowe Cargo Processing for the 80s). The

port was forced to explore more efficient means of communication and organization due to the scale of its throughput, which reached over a half million TEUs. This led to bottlenecks in the transportation chain and required drastic solutions.

It became clear that the bottlenecks were due to the exchange of paper documentation, which was a difficult and error-prone process, particularly for cargo clearance and movement. Expanding the port would only have led to an increase in this paperwork. These factors led to the development and implementation of the PCS, whose primary goal was to replace all paper-based data exchanges and, in doing so, reduce errors and the duplication of data over numerous documents.

The design was led by HM Customs and Excise—now HM Revenue and Customs—but other sectors of the port community also took part in the process. Their involvement is a point of pride and is one of the major success factors for the project.

Today, the port handles more than 3.4 million TEUs and welcomes over 4,000 ships each year, including the largest container vessels afloat today—crucially, it provides some of the deepest water close to the open sea of any European port. Around 33 shipping lines operate from Felixstowe, offering approximately 90 services to and from 365 ports around the world.

Together with its unrivaled rail and road links connecting the port to distribution hubs in the Midlands and elsewhere in the UK, Felixstowe plays a pivotal role in keeping the UK's trade moving and delivers real benefits to customers, the community, and the industry.

The PCS in Felixstowe, provided by Maritime Cargo Processing plc, is called Destin8. Felixstowe is just one of the many UK ports and inland clearance locations using this PCS, feasibility studies for which began in 1981. The system was first implemented in 1984 and has since evolved to become a fully integrated PCS.

Ownership

The PCS Destin8 is operated by Portis Ltd, which is owned by MCP and the Port of Felixstowe. The port is owned and operated by Hutchison Ports UK, a member of the Hutchison Port Holdings Group, a subsidiary of Hutchison Whampoa Ltd (HWL).[8]

Financial Model

The fees for the Destin8 PCS are publicly available and priced in pounds sterling for 2014. It uses a subscription model based on prices that depend on the levels and amounts of information and services made available to each user. The price of a full annual subscription is £1,050 and there is a sign-up fee of £500. There are also several different options for subscriptions with limited functionality.

Destin8 provides the following pricing information for import and export flows (EC refers to the European Community):

8 HWL is the largest foreign investor in Britain. A Hong Kong-based multinational conglomerate that is committed to innovation and technology, it employs more than 250,000 people in 53 countries around the globe.

Imports—port and manifested at depot

- EC cargo—unitized £0.50
- EC cargo—general cargo £0.50
- EC cargo—devanned cargo £0.50
- empties £0.10
- all other—unitized £1.70
- all other—general cargo £1.70
- all Other—Devanned Cargo £0.95

Exports

- EC cargo—unitized £0.70
- EC cargo—general cargo £0.70
- empties £0.10
- all other—unitized £0.70
- all other—general cargo £0.70

These fees provide interesting insight into the value of the PCS, as presumably these fees are offset by the savings for each of the stakeholders involved.

Users/Clients

The users listed by the PCS in Felixstowe are, as expected, those of a well-established port community system and can be summarized as follows:

- shipping lines
- importers
- exporters
- clearing/forwarding agents
- terminal operators
- port authorities
- haulers—road and rails
- government departments

Reported Benefits

The benefits listed by the PCS in Felixstowe largely depend upon the user:

shipping lines

- increased efficiency in loading and unloading
- reduction in turnaround times
- real-time status updates to improve customer service

importers

- reduced paperwork and faster information flow between importers and their clearing/forwarding agents
- goods arriving can be released through customs more rapidly
- inventory reduction (saving costs)

exporters

- reduced paperwork and faster information flow
- faster clearance for goods leaving the port

clearing/forwarding agents

- links with customs speed up the clearing process

terminal operators

- more efficient planning due to advanced notification
- reduction in double-keying and errors
- faster throughput

port authorities

up-to-the-minute statistical data

more efficient movement of dangerous materials

haulers—road and rail

- more efficient planning due to advanced notification
- entirely paperless pickup
- increased cargo security
- increased productivity

government departments

- increased availability of information
- availability of trade statistics

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