INTERNATIONAL MARITIME ORGANIZATION

E

4 ALBERT EMBANKMENT
LONDON SE1 7SR
Telephone: +44 (0)20 7735 7611 Fax: +44 (0)20 7587 3210

FAL.5/Circ.54
25 April 2024

GUIDELINES ON PORT COMMUNITY SYSTEMS

1 The Facilitation Committee, at its forty-eighth session (8 to 12 April 2024), approved the annexed *Guidelines on Port Community Systems*.

2 Member States and international organizations are invited to bring the Guidelines to the attention of all parties concerned.

3 Member States and international organizations are also invited to bring to the attention of the Committee, at the earliest opportunity, the results of the experience gained from the use of the Guidelines for consideration of action to be taken.

***

ANNEX

TABLE OF CONTENTS

1 Introduction

As the maritime industry stands at a transformative juncture, the need for digitalization and optimized efficiency across supply chains becomes paramount. Recognizing this pivotal moment, a unified consortium comprising Djibouti, Morocco, the Republic of Korea, FONASBA and IPCSA has taken a visionary step: the formulation of comprehensive guidelines on the PCS, scheduled for completion by 2024. This initiative stems from insights gathered during the FAL 46 session, which emphasized a holistic enhancement of trade facilitation frameworks.

Central to these guidelines is the role of the PCS in bolstering harmonization, standardization and interoperability in maritime operations. The guidelines will not only underscore the manifold benefits of PCS within the trade facilitation landscape but also guide Member States through the integration process, tied to the maritime single window (MSW). While the MSW focuses primarily on Business to Government (B2G) exchanges during vessel port arrivals, stay and departure, it does not fully embrace the spectrum of information exchanges vital for comprehensive maritime operations. This is where the PCS guidelines step in, expanding the horizon to encapsulate exchanges from Business to Business (B2B) and Government to Business (G2B), even stretching to potential Government to Government (G2G) interactions.

Furthermore, these guidelines will establish a universal foundation for PCS development, ensuring all Member States operate with a shared understanding. Emphasis will be laid on aligning the PCS's legal architecture with international maritime norms and conventions. In an era defined by rapid digital progression, the guidelines will also touch upon essential considerations in technology and cybersecurity, ensuring that PCS is future-ready and fortified against evolving threats.

The International Maritime Organization (IMO) remains at the helm of this venture, reinforcing its commitment to harmonizing diverse trade and maritime information exchange systems across national and international spectrums.

2 Scope

The goal of this document is to develop PCS guidelines providing common understanding of PCS, the role of PCS within harmonization, standardization and interoperability, PCS and Single Window (SW) environment interaction, as well as provide baseline considerations for PCS development.

The development of guidelines on PCS would stay within the scope of the IMO mandate to facilitate harmonization, standardization and interoperability of different private and public trade and maritime information exchange systems. It should support the goal of both national and international interoperability between various trade and single windows environments.

3 Target Audience

These guidelines are aimed at public authorities and administrations responsible for the development or modification of SW and PCS environments and Contracting Governments that encourage the introduction of SW and PCS environments. Depending on a country's situation, a Contracting Government may act as the public authority or administration. These Guidelines will also be helpful for consultants on behalf of public authorities or administrations and other stakeholders responsible for PCS and SW environment establishment.

4 Abbreviations

Abbreviation	Description
API	Application Programming Interface
B2B	Business-To-Business
B2G	Business-To-Government
BI	Business Intelligence
EDI	Electronic Data Interchange
e-AWB	Electronic Air Waybill
e-Booking	Electronic Booking
FFM	Flight Manifest
G2G	Government-to-Government
IS	Information System
ISPS	International Ship and Port Facility Security
IT	Information Technology
MAS	Maritime Assistance Service
MSI	Maritime Safety Information Service
MSW	Maritime Single Window
NAS	Navigational Assistance Service
NoTN	Network of Trusted Networks
PCS	Port Community System
PCSO	Port Community System Operator
POS	Port Operation System
PSS	Port Support Service
SRS	Ship Reporting System
SW	Single Window
TSW	Trade Single Window
TOS	Terminal Operating System
TOS	Traffic Organization Service
TMAS	Tele Medical Assistance Service
VSR	Vessel Shore Reporting

5 Common understanding of PCS

5.1 What is a PCS

A PCS is a neutral and collaborative digital platform that facilitates the intelligent and secure exchange of information between public and private stakeholders involved in port and terminal operations. By connecting various information systems of companies, authorities, and other entities within the maritime sector, a PCS streamlines and optimizes port operations, enhancing competitiveness. It serves as a single point of access to diverse port and logistics-related services, ensuring seamless data flow and promoting transparency and modernization in port services. Another strength of a PCS is that it also supports the reporting-only-once principle, which leads to a reduction in the administrative burden, and an increased measure on the quality of the control of the submitted information, as the submitted information is the same for all parties involved.

PCS are digital platforms transforming port, shipping, and logistics industries. They facilitate seamless interactions and data exchange among diverse stakeholders, enhancing operations for major international ports and empowering smaller hubs globally. PCS demonstrates adaptability to market changes and regulations, playing a pivotal role in creating an efficient, connected, and dynamic global trade ecosystem. Beyond cargo and trade, PCS integrate with maritime and nautical processes, acting as a Port Single Window (PSW) per IMO Guidelines for setting up a maritime single window. Serving as the nervous system of port mechanisms, they offer advantages such as enhanced efficiency, improved collaboration, and data-driven decision-making.

5.2 Stakeholders' Roles and Relations to PCS

5.2.1 Port Authorities

Role: They oversee the administration, safety, security, and sometimes the economic development of ports. This includes managing facilities, ensuring safety standards, and overseeing harbour activities.

Relation to PCS: Port Authorities might champion the development of a PCS to boost port efficiency and competitiveness. Their involvement is primarily to ensure that the PCS aligns with the port's strategic goals.

5.2.2 Port Stakeholders

.1 Role: This category encompasses all entities with vested interests in port operations. This list includes, but is not limited to, shipowners, ship agents, shipping lines, terminal operators, customs agencies, freight forwarders, ground transportation firms and competent authorities like customs, border control, food and health authorities, etc.

.2 Relation to PCS: These stakeholders interact with the PCS, either accessing or inputting data pertinent to their operations. Their commitment is pivotal as the PCS's value is amplified by shared, real-time, and accurate information that minimizes errors and costs.

5.2.3 PCS Operators

.1 Role: These entities are tasked with the operation and maintenance of the PCS, ensuring its day-to-day functionality. They could be stand-alone companies, consortiums, public-private partnerships, port operators themselves, or government authorities, depending on the model and the system in the country.

.2 Relation to PCS: As the linchpins of the PCS, operators manage its technical nuances, user concerns, updates, and ensure compliance with legal and security standards.

5.3 PCS: Beyond Just an IT Project

While the PCS hinges on IT for its operations, classifying it as merely an IT project oversimplifies its scope and impact.

The simple reasons why PCS is not just an IT project:

5.3.1 Process Re-engineering

Implementing a PCS demands a thorough assessment of existing processes, identifying bottlenecks, and standardizing methods for fluid digital integration.

5.3.2 Stakeholder Engagement

The success of a PCS is contingent on the active participation of all stakeholders. Their insights, needs, and concerns are crucial during the design and implementation phases.

5.3.3 Training and Change Management

Transitioning to a PCS mandates a paradigm shift. Stakeholders need adequate training and support to adapt to this new digital-first environment.

5.3.4 Governance

Establishing a robust governance framework is essential to monitor, manage, and evolve the PCS in line with global trends and emerging needs.

6 Role of PCS within harmonization, standardization and interoperability

6.1 Benefits of PCS within trade facilitation framework (government/ agencies/ community)

The integration of PCS within the trade facilitation framework has improved the global logistics and trade landscape. PCS is an advanced digital platform that connects various PCS stakeholders such as shippers, shipowners and ship agents, logistics service providers involved in trade, including government agencies, customs authorities, port authorities, trade organizations, businesses, and communities. This section outlines the multifaceted benefits of PCS in streamlining trade operations and fostering economic growth, transparency, and community engagement based on the reporting only once and re-use of data principles.

The wider benefits of PCS within trade facilitation networks encompass:

.1 Supply Chain Integration: PCS serves as a critical link in the supply chain, connecting various PCS stakeholders, facilitating seamless information and goods flow.

.2 Data-Driven Decision-Making: The system provides valuable data and insights for PCS stakeholders, enabling informed decisions on trade policies, infrastructure investment, resource allocation, and supply chain optimization.

.3 Collaboration and Coordination: PCS fosters collaboration among PCS stakeholders involved in trade, leading to smoother and more efficient operations through improved coordination.

.4 Environmental Sustainability: By optimizing logistics and reducing port congestion, PCS contributes to lower emissions and a reduced environmental footprint associated with transportation.

.5 Facilitation of Paperless Trade: PCS promotes paperless trade by digitizing and automating documentation processes, reducing paperwork, minimizing errors, and contributing to a more sustainable and streamlined trading environment.

.6 Streamlined Customs Procedures: PCS automates and streamlines customs procedures, reducing manual interventions and paperwork, resulting in faster customs clearance, and compliance with trade regulations.

.7 Improved Revenue Collection: PCS expedites trade procedures and reduces errors, enhancing revenue collection for governments by ensuring accurate and timely collection of customs duties, taxes, and other fees.

.8 Efficient Operations at Ports: PCS streamlines cargo handling processes, reducing waiting times and congestion at ports, leading to faster loading and unloading for carriers, forwarders, and transporters.

.9 Community Engagement: PCS allows communities to be more involved in port and trade activities, fostering cooperation and informed decision-making among community stakeholders.

.10 Access to Global Markets: Simplified and expedited trade procedures by PCS make it easier for businesses to import and export goods, broadening access to global markets and expanding business opportunities.

.11 Reduced Administrative Costs: The automation and digitization of trade processes through PCS reduce administrative burdens on government agencies, leading to cost savings and increased operational efficiency.

.12 Transparency and Accountability: PCS provides clear information on port activities, making the process more transparent. Communities can monitor trade-related developments and hold relevant stakeholders accountable.

.13 Enhanced Security: PCS enables better monitoring and tracking of cargo, reducing the risk of theft, damage, and unauthorized access within the port area.

.14 Risk Mitigation: PCS helps in risk assessment, fraud detection, and regulatory compliance enforcement through real-time data access, enhancing the overall security and reliability of trade operations.

.15 Adaptability to Changing Regulations: The flexibility of PCS allows for easy adaptation to changing trade regulations and compliance standards, ensuring that stakeholders can seamlessly adjust to evolving international trade requirements.

6.2 PCS Services

6.2.1 Maritime Services in the context of e-Navigation

Maritime Services are defined by IMO as ones that refer to the provision and exchange of maritime-related information and data in a harmonized, unified format (MSC 101/24/Add.1). Maritime Services are part of the IMO e-Navigation strategy (MSC.1/Circ.1595). e-Navigation itself is defined as the harmonized collection, integration, exchange, presentation and analysis of marine information on board and ashore by electronic means to enhance berth-to-berth navigation and related services for safety and security at sea and protection of the marine environment (as defined in the Strategy for the development and implementation of e-navigation (MSC 85/26/Add.1, annex 20)). As part of the improved provision of services to vessels through e-navigation, Maritime Services have been identified as the means of providing electronic information in a harmonized way.

The names and descriptions of the Maritime Services are defined in the e-navigation strategic implementation plan (MSC.1/Circ.1595 as revised), and as amended by the initial descriptions of the Maritime Services in the context of e-navigation (MSC.1/Circ.1610).

While Maritime Services are considered as machine-to-machine technical services, based on the onboard vessel equipment and VTS shore equipment, the content of these services is closely related to "traditional" ship-shore interaction, that is covered by the IMO Compendium and IMO guidelines for setting up a MSW.

In the context of a PCS, there are multiple Maritime Services that could be part of a PCS implementation. Information exchange regarding Maritime Services 4 (Port Support Service), 6 (Pilotage Service), 7 (Tug Services) and 8 (Vessel Shore Reporting) are regularly implemented by means of a PCS.

6.2.2 Port Services

MS 4 – Port support service (PSS)

Port support service (PSS) is defined as a service in support of a ship calling at a port. It provides information necessary to organize and support the port call and varies depending on the local needs. PSS may relay information from related Maritime Services and may incorporate other services if the respective MS is not available at a port. Examples of PSS include:

.1 Berth and mooring details.
.2 Waste handling arrangements.
.3 Fuel/bunkers.
.4 Energy supplies from shore sources.
.5 Crane and other cargo handling arrangements.
.6 Provisioning.

.7 Water supply.
.8 Support to Customs and Immigration.
.9 ISPS information.
.10 Supporting the submission of reporting formalities.

Some of these services may not be executed by the port, but requests, supporting documents and clearance deliverables could be submitted through PCS. The list represents a normal operational list of the activities, provided to the vessel by the port or the port terminal. In most cases, these activities could be internally implemented in the Port Operation System (POS) or Terminal Operating System (TOS). The operation and interaction of such systems within the port are maintained by the PCS.

Traditional implementation of such port support services are:

.1 Providing information on the services, available in the port (or on the Terminal).

.2 Providing the terms and conditions for each of the services listed.

.3 Providing the way to book the service (including the planning and queue information where applicable).

.4 Providing the service request tracking status.

.5 Invoicing.

Such interaction can be implemented between the port and the shipowner (or ship agent) and is part of the PCS functionality. The provided data may be used for operational planning by both the terminal and vessel, as well as other actors in the port (authorities, tug companies, suppliers, etc.).

Port support services, as an example, could be implemented as an interaction between PCS and e-Navigation. In the context of e-Navigation, such interaction is implemented as direct messaging between ship and shore equipment (IMO proposes S-100 based data model). Such facilitation allows to receive at least part of the information directly from the ship master, excluding the shipping agent. Still, the role of the agent remains valuable, including local authorities' interaction, work planning, and invoicing. Thus, the implementation of the e-Navigation could add one more specific API or technical layer, that extends the number of actors involved into the data exchange process and enhances the role of the PCS.

MS 8 – Vessel shore reporting

This Maritime service provides information from shore to ship about two different reporting regimes:

.1 Ship to shore reporting is implemented for pre-arrival reporting.
.2 Ship reporting system (SRS) is implemented for transit information reporting.

In most cases, the SRS reporting is not covered by the PCS functionality.

The VSR reporting is considered as information and guidelines related to reporting formalities and instructions (when, what, and how) for reporting to a specific port. In addition, this service can be extended to the full exchange of information required in a Single Window Ship reporting system.
The VSR regime may contain the following elements:

.1 Marine security regulations.
.2 Vessel Traffic Services zones regulations.
.3 Customs and immigration regulations.
.4 Port State regulations.
.5 Health and veterinary regulations.
.6 Environmental regulations.

Traditional Vessel Shore Reporting (or Ship Shore Reporting – in terms of the IMO FAL) includes all the information required by maritime safety, security, and health as well as the operational information and B2A reporting (customs, immigration and border control).

The IMO Compendium provides a list of data that could be electronically shared between maritime stakeholders, within VSR.

The European Union also provides a comprehensive data set (EU Delegated Regulation (EU) 2023/205) to be provided in the framework of the European MSW environment (EMSWe).

The EMSWe data set includes data elements for the following:

.1 IMO FAL declarations (1-7).
.2 Maritime Declaration of Health.
.3 Security information.
.4 Waste report.
.5 Customs information.
.6 National and local requirements.

Currently, the following communication systems are used in some cases to report information in addition to the normal operation of the PCS:

.1 AIS.
.2 Internet-based reporting systems.
.3 Email.
.4 Fax.
.5 SATCOM.
.6 Mobile phone.
.7 A combination of these systems.

Due to technical issues, the direct connection of the ship's master to the PCS is impossible or not effective in most cases. The shipping line or agent implements the role of the intermediary to provide all the necessary information.

6.2.3 Land Services

The land services of the PCS are focused on the interaction with parties, located in the port, and could be divided into two main groups:

.1 B2B interaction.
.2 B2G interaction.

B2B interaction

The general list of the land services that can be provided by the PCS for the community can be described by the following roles:

.1 Terminals.
.2 Shipowners (ship agents).
.3 Freight forwarders.
.4 Road transport.
.5 Rail transport.
.6 Air transport.
.7 Cargo community system.

Terminals

Both maritime terminals (that operate the vessels) and in-land terminals (or dry ports) are considered.

Terminals execute the main operational activity in the port and in some cases can be a port itself. While policies and requirements are the function of the landlord (or port authority), the business orchestration is often implemented by the community with the aim of the PCS. Due to terminals being the stakeholders of such PCS, they can significantly influence its function and operation.

General functions of the PCS for terminals:

.1 Providing a unified information dataspace to exchange data with the port stakeholders.

.2 Providing the tools to schedule concurrent resources, such as channels, peers, navigational and tug services, railway, and so on.

.3 Single Submission portals for terminal customers – shipping lines and freight forwarders.

.4 Unified integration with authorities and public single windows.

Shipowners (ship agents)

Shipowners and/or ship agents are also interested in PCS operating in the port to unify information exchange with the authorities and other stakeholders with whom they are required to interact.

General functions of the PCS for shipowners (ship agents):

.1 Providing a unified information dataspace to exchange data with all the port and supply chain actors.

.2 Providing the tools to organize and schedule the vessel's arrival and departure from the port and its cargo operations.

.3 Providing access to the port services, such as mooring, supplies, maintenance, and so on.

.4 Allowing unified integration with authorities and public single windows.

Freight Forwarders

Freight forwarders benefit from the use of the PCS by facilitating the interaction with terminals, shipping lines, and authorities. This allows them to use a single unified interface to provide and receive all necessary operational information.

In some cases, PCS can act as a marketplace for freight forwarders to propose their services to customers.

General functions of the PCS for freight forwarders:

.1 Providing a unified information dataspace to exchange data with port stakeholders.

.2 Providing the tools to schedule concurrent resources, such as terminal slots, port services, gates, and so on.

.3 Providing access to the port services, such as supplies, maintenance and so on.

.4 Unified integration with authorities and public single windows.

Port service providers

Port service providers benefit from the integration into the community and the possibility to list their service proposition in the port service catalogue (or Maritime Service Portfolio). As freight forwarders, port service providers also use PCS as a marketplace for sharing their service.

General functions of the PCS for port service providers:

.1 Providing a unified information dataspace to exchange data with other port community members.

.2 Providing access to the port services catalogue.

.3 Providing tools for booking, tracing, and invoicing the service provided.

Road Transport

The most significant function of the PCS for road carriers is the Gate Booking System. Such a solution allows carriers to schedule their entrance to the port and/or terminal dependently on the total load of the gates and the possibility of choosing the road and time of arrival. In some cases, such systems can implement a sort of just-in-time arrival solution to eliminate queues in the port gates area. In other cases, this solution includes special areas with parking places where trucks can wait for their entry time.

One more important function is preliminary information processing by using the road consignment notes as a data source for port and ship-related documents and vice versa.
General functions of the PCS for road transport:

.1 Providing a unified information dataspace to exchange data with terminals, shipping lines, and freight forwarders.

.2 Providing operational information for vessels, goods, and trucks movements.

.3 Providing the tools to schedule concurrent resources – gates, parking places, warehouses.

.4 Transformation of the data sets between modes of transport.

Rail Transport

In some cases, a railway is a bottleneck, or at least, a concurrent resource for the port. Thus, seamless scheduling of such a resource is essential for effective port operation. This includes cooperation between railway operators, port authorities, terminals, freight forwarders, and shipping lines. That is why integration of all these parties into the PCS environment can generate added value.

General functions of the PCS for rail transport:

.1 Providing a unified information dataspace to exchange data with terminals, shipping lines, and freight forwarders.

.2 Providing operational information for vessels, goods, and train movements.

.3 Providing the tools to schedule concurrent resources.

.4 Transformation of the data sets between modes of transport.

Air Transport

Air community systems become more and more common. Maritime port and airport operations can link as a logistics chain. In this case, integration between PCS and the airport community system takes place.

General functions of the PCS for air transport:

.1 Providing a unified information dataspace to exchange data between port and airport community members.

.2 Providing operational information for transport and goods movement.

.3 Providing the tools to schedule concurrent resources.

.4 Transformation of the data sets between modes of transport.

Cargo transport

Cargo transport services are developed as part of the PCS and are an implementation of the principle "Follow the cargo". This includes the integration of the end-customers (senders and receivers) for the goods transferred through the port into the port community. PCS can propose transparent cargo tracking, access to the marketplace of the port service providers, facilitation of the cargo and transport documents operation, and integration with public single windows for export and import procedures.

B2G interaction

The general list of the land services that can be provided by the PCS for the public authorities can be described by the following parts:

.1 vessel clearance (transport level).
.2 goods clearance (trade level).

Though these activities are heavily linked, they still can be executed in different moments of time and with involvement of different parties.

Vessel Clearance

This is transport related B2G interaction and normally it is executed via Maritime Single Window (MSW) from the public side. The main involved authorities are Customs, Immigration, Port Health and Maritime Authorities, Port Authority in some cases other authorities, such as the Sanitary and Epidemic Safety Agency, can be involved.

Goods Clearance

This is trade related B2G interaction and normally is executed via Trade Single Windows. The main involved public authority is customs, but also there could be other authorities participating such as zoosanitary and phytosanitary authorities.

6.2.4 Transversal Community Services

Community Business Intelligence

As part of the PCS, it is essential to emphasize the fundamental role of data and the presence of a shared decision support infrastructure between interconnected stakeholders. A unified decision support system can act as a hub and encourage collaborative decision-making among port operators, enabling them to harness the potential of data to streamline operations, improve resource allocation and increase situational awareness. PCS can foster synergy between the various entities of the port community, encouraging the exchange of real-time data, optimizing the distribution of resources and, ultimately, improving the efficiency, sustainability and resilience of the entire maritime logistics chain using Business Intelligence (BI) domain services, based on big data, machine learning and artificial intelligence, to encourage collaborative decision-making.

These BI-domain services play a pivotal role in the awareness and the acceptance of the community stakeholders where they can actively see and follow up the benefits certain electronic services bring to the port community.

As this obviously is a specific and uniquely defined functionality per each PCS in their interaction with the specific stakeholders, there will be no nominal enumeration of which services are "essential" in this section, but it is of huge importance that the types of services and their presence within a PCS is critical and improves and ameliorates the degree of adoption of the PCS by the stakeholders; therefore these types of services are referenced here and, as a guideline, should not be forgotten in the implementation of a PCS.

6.2.5 Passenger and Crew Services

PCS plays a role in managing various services related to cruise and ferry passengers to ensure smooth and efficient operations in ports. These services are designed to enhance the passenger experience, ensure compliance with immigration and customs regulations, enhance security, and streamline the process of disembarkation, embarkation, facilitate efficient port operations and overall passenger handling. Here is an overview of services related to cruise and ferry passengers within a PCS solution:

.1 Crew and Passenger Declaration:

The Crew and Passenger Declaration module within PCS streamlines the process of submitting detailed information about passengers and crew members before their arrival at the port. This involves crucial Business-to-Government (B2G) interactions, where the PCS acts as a facilitator for efficient customs and immigration clearance procedures. Moreover, the integration of the MSW into the PCS adds significant value to this process. The MSW is a comprehensive system that enables the electronic submission of maritime-related information to the relevant authorities. Within the context of Crew and Passenger Declarations, the PCS can seamlessly interface with the MSW, ensuring the smooth submission of required information to government agencies responsible for immigration, customs, and port security. This integration not only enhances the efficiency of the declaration process but also contributes to the overall effectiveness of border control and security measures. This integrated approach simplifies administrative procedures, reduces manual interventions, and ensures compliance with regulatory requirements, ultimately fostering a secure and well-managed maritime environment.

.2 Crew Change Request and Approval:

This module enables the shipowners and ship agents to submit crew change requests. Crew changes are common in the maritime industry due to rotation schedules, contract expirations, or emergencies. The request goes through an approval workflow, involving port authorities, immigration, and customs officials. The approval process ensures that crew changes comply with legal and security requirements. Approved crew changes trigger resource planning at the port. Port operators need to allocate berths, immigration personnel, and other resources accordingly to facilitate the crew change smoothly.

.3 Landing Certificate Generation and Approval:

Shipowners and ship agents may request landing certificates for passengers or crew members, which may be required for certain legal or administrative purposes, such as crew members disembarking for medical reasons. Port authorities review the landing certificate requests. They assess the validity of the requests and ensure that they meet the necessary criteria. Approved certificates are generated and issued. Landing certificates are essential documents for passengers or crew members to disembark or enter a country legally. They may be required by immigration authorities, or other relevant entities.

.4 Shore Pass Registration:

Passengers or crew members who wish to go ashore temporarily may submit shore pass requests. Shore passes are typically required when individuals want to leave the port area temporarily for leisure, business, or personal reasons. The submitted requests are verified by port authorities and immigration officials to ensure they comply with regulations and security measures. Approved shore passes are issued. Port authorities may monitor individuals with shore passes to ensure they return to the vessel within the specified time frame. Failure to do so may lead to security concerns or immigration violations.

.5 Passenger Information and Communication:

The PCS serves as a platform for providing passengers with essential information, including departure and arrival schedules, port services, local attractions, and emergency instructions. Communication features, such as alerts and notifications, keep passengers informed.

The functional process overview of passenger services in the maritime industry covers various aspects of managing passengers and crew members arriving at or departing from a port. These processes ensure compliance with legal and security requirements while facilitating the efficient operation of maritime activities. The use of digital platforms, such as PCS, plays a pivotal role in streamlining these processes and enhancing overall port management.

6.2.6 Airport Services

Airport services encompass a wide range of activities and processes that ensure the efficient and safe operation of an airport cargo. These services are critical for the aviation industry and contribute to the seamless movement of goods. Below is an overview of some key modules within airport services, which not only contribute to the efficiency of air cargo logistics but also play a pivotal role in enhancing and digitizing operations within the maritime domain:

.1 e-AWB (Electronic Air Waybill): The e-AWB module digitizes the traditional paper air waybill used in air cargo operations. It has the function to capture and amend AWBs. FWB/FHL messages can be triggered to the airlines and handlers to give them pre-alerts. Also, it has a provision for AWB stock management. It allows for the electronic creation, transmission, and storage of air waybill information, streamlining cargo processes, reducing paperwork, and improving data accuracy.

.2 e-Booking (Electronic Booking): The e-Booking module enables forwarders to view the airline schedules and requests for bookings. Standard EDI messages can be exchanged to request booking and receive confirmation from airlines. It simplifies the process, provides real-time availability information, and facilitates communication between stakeholders.

.3 Online Certificate of Origin: This module digitizes the process of obtaining a Certificate of Origin for cargo shipments. It streamlines the application and approval process, reducing paperwork and administrative workload.

.4 Export/Import Declaration Filing with Customs: This module handles the electronic submission of export and import declarations to customs authorities. It ensures compliance with trade regulations, facilitates customs clearance, and minimizes delays in cargo processing.

.5 e-Manifest Filing: This module enables to convert the FFM (Flight Manifest) messages received from airlines to Customs format and file them with Customs. Acknowledgement received from customs can be sent back to the airlines.

.6 e-Payments: This module enables the freight forwarders with a provision to pay the terminal storage and processing charges online, thus ensuring quicker recognition of payments and seamless transactions. The community system enables various services for the stakeholders to make the e-payments for their cargo.

.7 Truck Dock Appointment Booking: This module enables trucking companies and cargo handlers to schedule appointments for the pickup or delivery of cargo at specific truck docks within the airport. It helps manage traffic flow, reduce congestion, and improve overall logistics efficiency.

These modules collectively contribute to the efficient and digitized operation of airports, enhancing the customer experience, optimizing cargo handling, ensuring security and compliance, and streamlining administrative processes. Digitalization and automation of airport services are essential for the modern aviation industry to meet the demands of a rapidly evolving global economy.

7 PCS and Single Window

7.1 Introduction: A controlled vocabulary

UNECE-UN/CEFACT Recommendation n°33 (ECE/TRADE/352[1]), released in 2005, describes the basis for establishing a Single Window for export, import and transit clearance. In 2017 UNECE - UN/CEFACT Technical Note on Terminology for Single Window and other electronic platforms provides the key elements for an official definition of Single Window to create a controlled vocabulary in order to be clear about the scope and nature of any given mechanism:

Table 2 – Terms based on the five key elements of Recommendation 33 definition

	Exclusive on the market for this type of operator	**Standardized information and documents**	**Government mandate for Single Entry Point**	**Regulatory processes**	**Single submission point for individual data elements**
Single Window	Must be	Must use	Must have	Must include	Must be
Single Submission Portal	Can be	Must use	Can have	Can include	Should be
Single Environment	Can be	Must use	Can have	Must include	May be

Therefore, and according to UNECE, a PCS can be considered a Single Window system if it satisfies the five key elements and principally that the PCS operator holds a clear mandate from the government to be the sole provider of specific regulatory functions in the given economy and that there is only one PCS operator in a given economy, otherwise they might be considered a Single Submission Portal as described in UNECE-UN/CEFACT Recommendation n°37 (ECE/TRADE/447).

In 2018, the World Customs Organization introduced, in its latest version of Single Window Compendium [3], the notion of single window environment including Cross Border Regulatory Single window (known also as Trade Single Window) and PCS that could be considered a Single Window system if it satisfies the five key elements of the definition of Recommendation 33.

7.2 Single Window Environment

A Single Window environment can exist on a number of Port Community Systems and/or Single Windows, including maritime single window (MSW) and trade single window (TSW).

The scope of each of the three single windows are:

.1 MSW scope per FAL Convention relates to the arrival, stay and departure of ships.

.2 PCS scope is to optimize, manage and automate port and logistics processes through a single submission of data and connecting transport and logistics chains.

.3 TSW, also known as Cross Border Regulatory Single Window scope, is related to issuing licences, permits and certificates and exercise the requisite control on goods at borders.

In practice, the above three single window systems could co-exist within one country and should be interoperable. In some countries such as Israel, the MSW can be part of the scope of the PCS; or likewise in Kenya the MSW can be part of the scope of the TSW; or as in Peru, the MSW and the PCS could be integrated in the overall TSW architecture.

In some cases, PCS can implement part or all of the functions of the MSW, or TSW. In other cases, the interoperability between these single windows and PCS should be implemented. When not an integral part of the MSW or TSW, the PCS could function as a Single Submission Portal as recommended in UNECE Recommendation 37 (ECE/TRADE/447) and mentioned in section 7.1.

Notwithstanding local legal and technical requirements, some general considerations could be mentioned regarding interoperability of the PCS in a Single Window:

.1 **MSW Integration and Ship-Shore Reporting**: While PCS accommodates a much wider amount of information than MSW requires, it is considered good practice to use PCS as a data provider for MSW. This is in line with the IMO Guidelines for setting up a Maritime Single Window, as revised.

.2 **TSW:** Integration with customs authorities is essential for seamless operation for the port and port community. Depending on the national implementation of the MSW and TSW, different scenarios of the dataflow may imply:

.1 MSW is providing customs–related information to customs – in this case no extra integration between PCS and TSW is needed – all information is exchanged between authorities via MSW.

.2 Customs-related information is to be provided directly to Customs (Trade) Single Window – in this case, dedicated integration between PCS and TSW should be implemented.

The amount of information to be provided to TSW includes vessel and goods-related information. This includes preliminary information (entry and exit summary declarations) and data that should be provided on arrival and departure.

If TSW also integrates other authorities, such as immigration, border control, health, phytosanitary, and so on, extra information could be provided using a single integration API.

In most cases, TSW provides feedback in the form of clearance messages (from customs or from other authorities).

Finally, and whatever the single window environment architecture of a country is, the PCS needs to be able to be interoperable with each of the MSW and the TSW to provide end-to-end visibility of the movement of goods. Interoperability shall be implemented according to UNECE-UN/CEFACT Recommendation 36* (ECE/TRADE/431).

* Rec36_2017-ECE-TRADE-431E.pdf (unece.org)

8 Baseline considerations for PCS development

This chapter serves as a focused exploration into the fundamental baseline considerations crucial for the development of a PCS. Specifically detailed in annex A to this document, the chapter unfolds with an emphasis on two pivotal aspects: Technology and Cybersecurity, and Ongoing Development Initiatives.

8.1 Creating Community

Developing a PCS with a primary focus on "Creating Community" emphasizes the critical nature of fostering collaboration, trust, and mutual benefits among all stakeholders involved in the port ecosystem. The PCS's value is inherently tied to the number and activity of its participants, making it imperative to engage stakeholders effectively and cultivate a sense of ownership and shared benefits within the community. In pursuit of this objective, there are some baseline considerations to keep in mind, including clear communication, customization, training and support, incentives, feedback mechanisms, and a robust governance structure, all of which contribute to the success of the PCS and the vitality of its community.

.1 Stakeholder Identification: Recognize and involve all relevant stakeholders, including port authorities, customs, terminal operators, carriers, freight forwarders, shippers, hinterland operators, and more. Understanding their individual needs and concerns is the first step in creating a robust community.

.2 Engagement and Outreach: Regularly engage with stakeholders through workshops, seminars, and feedback sessions. Active communication ensures that stakeholders feel heard and involved.

.3 Shared Vision: Create a shared vision of the PCS that aligns with the collective goals of the community. A common understanding of the system's objectives and benefits will foster unity.

.4 Collaborative Design: Involve stakeholders in the design and functionality of the PCS. Co-designing the system ensures it caters to the diverse needs of the community.

.5 Transparent Governance: Develop clear governance structures that define roles, responsibilities, and decision-making processes. Transparency in operations and decision-making fosters trust among stakeholders.

.6 Education and Training: Regular training sessions will not only familiarize users with the system but also underline the benefits of active participation.

.7 Community Champions: Identify and nurture community champions from various stakeholder groups. These champions can influence their peers and drive community participation.

.8 Incentive Structures: Consider introducing incentives for active participation, especially in the early stages. This could be in the form of reduced fees, premium features, or other tangible benefits.

.9 Feedback Mechanisms: Establish mechanisms through which stakeholders can regularly provide feedback. Regularly evolving the PCS based on feedback ensures it remains relevant and valuable to the community.

.10 Collaborative Problem Solving: Foster a culture where issues and challenges are addressed collaboratively. This not only leads to more effective solutions but also strengthens community ties.

.11 Networking Opportunities: Organize events or platforms where stakeholders can network, share best practices, and discuss industry trends. Such platforms strengthen community bonds and foster a culture of sharing and collaboration.

.12 Promotion and Advocacy: Regularly promote the successes and benefits of the PCS to the broader industry and potential new members. Highlighting success stories can attract more stakeholders to the community.

.13 Trust Building: Ensure that data sharing, security, and user privacy are top priorities. When stakeholders trust the system, they are more likely to participate actively.

.14 Scalability and Inclusivity: Ensure that the PCS can accommodate small and large stakeholders alike. Offering features and functionalities catering to different stakeholder sizes and capacities fosters inclusivity.

.15 Shared Benefits Realization: Continuously measure and communicate the tangible benefits of the PCS to the community. Demonstrating the value derived from participation will encourage continued and increased involvement.

The main practical tools to address all these considerations are the PCS steering committee and the PCS Working Group forum:

.1 Set up a PCS Steering Committee forum which will review and approve the annual and multi annual working plan defining the action priorities and receive reports on the progress of the approved projects. This forum should meet periodically, quarterly at the beginning of the PCS implementation and deciding the frequency as needed as the advanced stages of the PCS.

.2 Set up a PCS Working Group forum, existing from subject matter experts in the port community, which will be involved in the details and coordinate the implementation of the various PCS services. This forum should meet periodically, monthly at the beginning of the PCS implementation and deciding the frequency as needed as the advanced stages of the PCS.

.3 Include in these forums a representative from each relevant stakeholder.

.4 For having a manageable number of members at the PCS steering committee, it is preferable to have representative associations, which can be the voice of their respective members (e.g. associations of ship brokers and agents instead of multiple individual ship brokers and agents).

.5 Each forum member will be given the possibility to add to the agenda relevant issues to be discussed.

.6 Dedicated working groups may be created to discuss specific processes with relevant experts.

After the PCS' successful implementation, it is important that the forums stay involved in the extension of the PCS.

These considerations and tools collectively play a vital role in cultivating a robust and engaged community around the PCS, facilitating collaboration, trust, and the realization of mutual benefits among all stakeholders within the port ecosystem. In essence, the thriving and active participation of this community is inextricably linked to the PCS' success, underscoring the imperative of prioritizing community building throughout its development process.

8.2 Legal framework

The implementation and operation of a PCS involves many activities that may be directly or indirectly affected by many laws and regulations, depending on the national systems and their governance models.

The operation of the PCS could be affected by an enabling legal framework, directly or indirectly, covering both national and international legal and regulatory measures. These may include international laws, agreements, treaties, national laws (laws, statutes, decrees, etc.), decisions and ordinances (ministerial decrees, decrees of regulatory authorities, etc.), case law (binding judicial precedents), contractual arrangements, standard international agreements, industry guidelines and best practices, etc.

The direct enabling legal framework is based on specific PCS regulations, which can also be included within the legal framework governing critical infrastructure and/or customs procedures, while the indirect enabling legal framework covers areas such as electronic signatures, electronic documents, data integrity, data sharing and data access, data privacy and data protection, data retention, archiving and use of data as evidence, cloud computing, competition law, intellectual property law, dispute resolution, mutual recognition and other issues related to cross-border information exchange.

The previously established comprehensive legal framework regarding the legal status of electronic communications, their equivalence to paper documents, electronic signatures and privacy and data retention contributes significantly to the successful implementation and operation of PCS but is not an absolute prerequisite for it. Often, the use of PCS within the supply chain "fills in" gaps within the national legal framework. It could also be used as an indication/reason for the need to establish or adjust the relevant legal framework.

Awareness and adaptation of the relevant legal and regulatory framework is a critical component of a PCS change management strategy and a prerequisite for a successful PCS implementation, to a large extent in emerging and developing countries.

8.2.1 Establishment of the PCS Operator

A PCS can be set up and operated, following the existing legal framework such as national laws, by-laws, regulations, statutes, decrees, etc. or without the need for specific enabling legislative instruments. Rather, it is the actions of certain authorities, such as ministerial directives, regulations, ordinances, etc. that are based on political consensus or on the need for a single authority or private agreements between multiple stakeholders.

The foundation layer of the legal framework may be based on the establishment of the PCS operator through one of the three schemes of operating model introduced in chapter 8.2: (i) business unit of a line ministry or a port authority, (ii) a public specific purpose vehicle such as a stated owned enterprise or private corporation, (iii) public private specific purpose vehicle or private corporation. Particular attention should be given in the context of a concession

agreement or a contract management related to the PCS operator. Once established, the PCS Operator may lead and/or contribute towards the development of a legal and regulatory framework related to the use of PCS.

8.2.2 Legal and Regulatory Environment

A legal and regulatory framework assessment and revision might be required for the implementation of the PCS operator and the PCS at the national level to enable the existence of the PCS operator and PCS in the national legislation. Some jurisdictions are enforcing the mandatory use of the PCS through various legal mechanisms such as Customs and Port regulations to a Presidential Decree depending on the Member State.

Table 3 – Legal Framework Review

Government	Topics	Legal Framework (not limited to)
Line ministries and governmental agencies	Existence of PCS in the national legislation Mandatory use of PCS by all stakeholders Standards operating procedures Reporting obligations Paperless International compliance Law enforcement coordinated border management Data-driven risk management Supply chain security Terminal operators' concessions	Port Act Port Security Act Maritime Act Customs Act Immigration Act Health Act Agriculture Act Environment Act Biosecurity Act Carriage Good at sea Act
Digital ministry	Data governance interoperability framework Performance monitoring Enforcement	Data Governance Act Digital Government Act Electronic Transaction Act Data Protection Act Transparency Act E-Commerce Act Open Data Act
National security	Resilience of critical infrastructure	Cybersecurity Act Critical Infrastructure Act
Telecommunications regulator	Enabling high performance and resilient infrastructure including Cloud, Fibre, 5G	Cloud Act Fiber Act 5G Act

Specific attention shall be given to the Customs Act and the Maritime Act. As a strategic partner of the PCS operator, customs administration cooperation with the PCS operator will be paramount to review the Customs Act and to empower the existence of the PCS in topics such as interoperability, paperless environment, customs declarations and procedures, data-driven risk management and selectivity, authorized economic operator, post clearance audit, offences and penalties, and standards operating procedures. The Maritime Act revision should focus on the compliance with IMO FAL.12(46) resolution on the MSW, when the MSW is a PCS service.

The range of fundamental laws related to electronic records and transactions, privacy and data protection, and data security laws are vital in the establishment of a PCS.

8.2.3 Operating Agreements

A robust and comprehensive legal framework is of paramount importance in the development and the seamless operation of a PCS operator. This framework serves as the cornerstone for building trust, delineates clear responsibilities, and guarantees adherence to local, national, and international regulations. To establish a sound legal foundation for PCS development, the following key considerations are fundamental:

.1 Data Privacy and Protection: Ensure compliance with data protection regulations, including General Data Protection Regulation (GDPR), and establish mechanisms for data consent, storage, transmission, and deletion.

.2 Stakeholder Agreements: Draft clear agreements or Memorandums of Understanding (MoUs) with stakeholders, outlining roles, responsibilities, data-sharing provisions, and liabilities.

.3 End-user agreement.

.4 Intellectual Property Rights (IPR): Address ownership of software, data models, and innovative features developed for the PCS. Secure copyrights, trademarks, or patents as needed.

.5 Cybersecurity Regulations: Adhere to cybersecurity standards and define responsibilities in case of data breaches or cyberattacks.

.6 PCS Operator service level agreement (SLA) and statement of Service Level Objective (SLO): Service Level Agreements (SLAs) shall include clearly outlined quality of service, uptime, and critical metrics, including provisions for penalties or remedies in case of non-compliance.

.7 Interoperability and Open Standards: Ensure compliance with open standards for interoperability across jurisdictions.

.8 Dispute Resolution: Establish clear processes for resolving disputes among stakeholders, considering mediation or arbitration clauses.

.9 Data Ownership and Usage: Define data ownership and permissible uses, especially for aggregated or anonymized data.

.10 Liability: Specify liability in cases of system errors, data breaches, or operational failures, and consider insurance provisions.

.11 Compliance with Trade and Customs Regulations: Ensure alignment with local, national, and international trade regulations and mechanisms for adapting to changes.

.12 Access Rights and User Permissions: Establish a framework for granting different levels of access to users, with consequences for unauthorized access or data manipulation.

.13 Termination Clauses: Specify conditions for stakeholder exit, including data retention and deletion upon termination.

.14 Jurisdiction and Governing Law: Define the legal jurisdiction governing PCS operations, especially for PCS' operating across borders.

.15 Transparency and Disclosure: Define information disclosure requirements about PCS operations and performance, ensuring adherence to transparency regulations.

.16 Audit and Oversight: Establish provisions for regular audits to ensure compliance with legal and operational standards, including the responsible parties and the process for addressing findings.

The legal and regulatory framework is vital for ensuring the seamless operation of the PCS operator, safeguarding the interests of all stakeholders, and cultivating trust in the system's reliability and sustainability.

8.3 Organizational model and Governance

8.3.1 PCS Operator

A PCS operator has the role of the entity responsible for the PCS. It acts as a trusted third party of a critical information infrastructure which enables public and private data collaboration and facilitates the seamless exchange of information among the port community. The responsibilities of the PCS Operator are the design, build, finance, operation, maintenance and evolution of the PCS in the long term. It involves working closely with public and private port stakeholders to ensure effective data collaboration, legal and regulatory compliance, and the adoption of new processes and technologies.

8.3.2 Operating Model

PCS operating models are categorized around three schemes. PCS can be operated by either a public entity, a private entity or via a Public-Private Partnership (PPP) scheme.

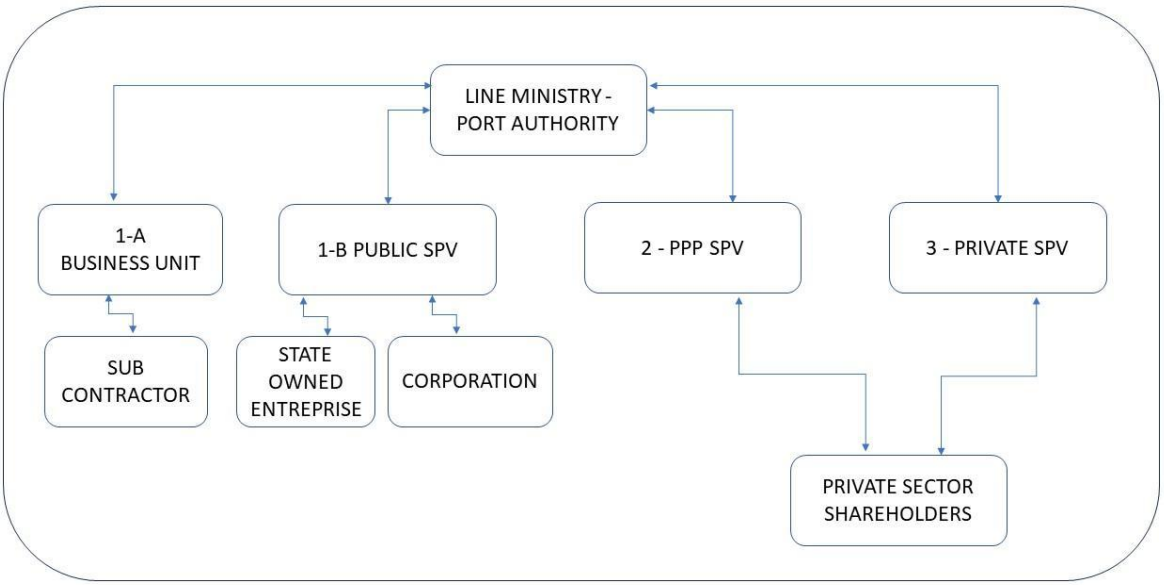
Scheme 1-A relates to a line ministry or a governmental agency, such as a port authority business unit as the entity taking the role of PCS operator. The design, implementation and maintenance could be partially or totally subcontracted.

Scheme 1-B relates to a line ministry or a governmental agency such as a port authority establishing a specific purpose vehicle such as a state-owned enterprise or a private corporation taking the role of PCS operator.

Scheme 2 relates to a PCS operator that is established through a public-private specific purpose vehicle through a public-private partnership, concession agreement or a contract management from the line ministry or the authority.

Scheme 3 relates to a PCS operator that is managed by a private operator through a concession agreement, contract management or strategic partnership from and with the line ministry or the authority or from a sole community-based approach.

Figure 1 – PCS Operator Types



8.3.3 Governance Framework

The governance structure is necessary to drive change management and ensure effective collaboration and coordination between public and private stakeholders involved in the inception and development of the PCS, usually working as silos. The governance framework will depend on the scope of the PCS project. Whether it be a local port community project or a national port communities project, it impacts the complexity of the governance.

In the case of a local PCS project, a steering committee, a business process committee, ad hoc working groups and a project implementation committee would be required along with the participation of all key public and private stakeholders.

In the case of a national PCS project owned by the Government, an inter-ministerial committee, a steering committee, a business process committee, ad hoc working groups and a project implementation committee would be required along with the participation of all key public and private stakeholders. The steering committee could take the form of a Sub-Committee of a National Port Community Council (NPCC) or the National Trade Facilitation Committee (NFTC). In the case of a national PCS project not owned by the government, the inter-ministerial committee could not be needed.

A well-designed PCS governance framework would help to ensure that the PCS is aligned with the strategic objectives of the governmental agencies, port communities, promotes transparency and visibility, and creates value among stakeholders. Establishing an initial governance framework during the inception process would facilitate collaboration and cooperation between the stakeholders and reduce the risk of project failure.

8.3.4 Role and responsibilities of the Port Community System Operator

The role of a Port Community System Operator (PCSO) ranges from the design and development of the platform to its day-to-day operation, maintenance, support, and evolution. The operator must ensure that the platform meets port stakeholders' needs and provides value to the entire port community. Some of the key responsibilities of a PCSO include:

.1 Management.
.2 Design and development.
.3 Operation.
.4 Maintenance and support.
.5 Sustainability.

8.4 Functionality and Services

When developing a PCS, emphasis on functionality and services is paramount, as they define its value for stakeholders. Here are fundamental factors to consider in developing PCS functionality and services, which serve as its core utility to users.

8.4.1 User-Centric Design

.1 Conduct user research to understand needs.
.2 Develop intuitive user interface/user experience (UI/UX) based on feedback.
.3 Create customizable dashboards for different roles.

8.4.2 Data Interchange and Integration

.1 Identify data exchange requirements.
.2 Implement open standards and APIs.
.3 Test and ensure compatibility with existing systems.

8.4.3 Legacy System Integration

When legacy systems with proprietary data formats and interfaces exist, at the early stages of the PCS introduction, some data format/interface conversion services should be considered.

8.4.4 Common Data Tables Services

An additional tool for achieving a common language for all the community is to supply common data tables services, which will be based on international standards.

8.4.5 Real-time Data Exchange

.1 Select real-time data processing technology.
.2 Develop data exchange protocols.
.3 Monitor and optimize for speed and accuracy.

8.4.6 Tracking and Documentation

.1 Implement vessel and cargo tracking modules.

.2 Create a centralized document repository.

.3 Automate document processes.

8.4.7 Customs and Compliance

.1 Integrate customs tools and regulatory checks.
.2 Ensure compliance with trade regulations.
.3 Conduct audits and compliance testing.

8.4.8 Security and Access

.1 Establish cybersecurity measures.
.2 Implement role-based access control.
.3 Regularly update security protocols.

8.4.9 Operational Visibility

.1 Develop real-time operational dashboards.
.2 Monitor berth occupancy, equipment availability, and traffic.
.3 Provide historical data for analysis.

8.4.10 Notification and Alerts

.1 Design an alert system for key events.
.2 Configure automatic notifications.
.3 Ensure alerts reach relevant users.

8.4.11 Booking and Scheduling

.1 Create a booking and scheduling module.
.2 Enable stakeholders to reserve resources.
.3 Implement conflict resolution mechanisms.

8.4.12 Reporting and Analytics

.1 Integrate data analytics tools.
.2 Develop reporting templates.
.3 Train users on reporting features.

8.4.13 Mobile Functionality

.1 Design responsive mobile interfaces.
.2 Develop dedicated mobile apps.
.3 Ensure cross-browser compatibility.

8.4.14 Collaboration Tools

.1 Provide communication platforms (e.g. chat, forums).
.2 Implement ticketing systems for issue resolution.
.3 Train users on collaboration tools.

8.4.15 Scalability

.1 Regularly assess system performance.
.2 Optimize databases and servers.
.3 Scale infrastructure as needed.

8.4.16 Sustainability

.1 Integrate eco-friendly features (e.g. route optimization).
.2 Monitor environmental metrics.
.3 Share sustainability best practices.

8.4.17 APIs and Extensibility

.1 Develop and document APIs.
.2 Encourage third-party developers to build extensions.
.3 Test API integrations thoroughly.

8.4.18 Continuous Updates

.1 Establish an agile development process.
.2 Prioritize user feedback for updates.
.3 Communicate and train users on new features.

8.5 Technology and Cybersecurity

The technological foundation of a PCS is pivotal, shaping the system's performance, scalability, and adaptability. When delving into PCS technology considerations, these foundational factors come to the forefront:

.1 Scalable Architecture: Opt for modularity and choose between cloud-based or on-premise solutions based on security and infrastructure requirements.

.2 Interoperability: Rely on international data format standards and embrace open standards to facilitate seamless data exchange with stakeholders.

.3 Data Management: Select efficient databases for handling large volumes, ensuring data redundancy and robust backup mechanisms.

.4 Connections and interfaces: The Internet shall be used as the primary connection. This will make the onboarding of new stakeholders easier. Services development shall take into account the quality of the existing Internet infrastructure. If the penetration rate of broadband access is low, the application may need to have less graphical components or other components with high use of bandwidth.

The PCS shall have various interfaces that will fit the unique needs of the various stakeholders:

.1 Large enterprises: Computer-to-Computer communication, preferring API.

.2 SME and individual users: Online web services and smartphone applications.

.3 Mobile and Web Accessibility: Create mobile-friendly designs with cross-browser compatibility.

.4 Real-time Processing: Prioritize technologies supporting real-time data processing.

.5 AI Integration: Explore machine learning and AI for predictive analytics and automation.

.6 UI/UX Design: Apply modern design principles and gather user feedback for continuous enhancement.

.7 Network Infrastructure: Ensure a resilient network infrastructure with sufficient bandwidth and quality of service measures.

.8 Performance Optimization: Ensure scalability, monitor performance, and optimize as needed for system growth.

.9 Sustainability: Consider environmentally friendly technologies and hosting solutions to minimize the system's environmental impact.

.10 Agile Development: Adopt agile methodologies for continuous improvement, version control, testing, and deployment.

.11 Documentation: Maintain comprehensive technical documentation and a knowledge base for effective support.

It is important to understand that once the PCS is operational, the port community cannot function without it, and it becomes a critical information infrastructure for the port/area/country.

That is the way the PCS shall be implemented using "cybersecurity by design":

.1 Cybersecurity standards and guidelines implementation:

.1 ISO/IEC 27001 ("Information technology – Security techniques – Information security management systems –Requirements").

.2 ISO/IEC 27002 ("Information technology – Security techniques – Code of practice for information security management").

.3 IAPH "Port and port facilities Cybersecurity Guidelines 2021".

.2 Access control protection measures implementation: multi-factor authentication, encryption, regular security patches updates, vulnerability assessments, firewalls, and intrusion detection.

.3 High Availability: Incorporate redundancy, Internet suppliers and access, IT infrastructure, data centre physical infrastructure and explore geographically distributed data centres for reliability.

.4 Backup and Recovery: Establish robust backup and disaster recovery strategies: disaster recovery site, site data backup, continuity plan which shall be periodically exercised.

These key considerations form the foundation of robust PCS technology, ensuring its effectiveness in the digital age and benefiting the entire port community.

8.6 Ongoing Development

To maintain the relevance and effectiveness of a PCS amid rapid changes, continuous development is imperative. Here are key considerations for ongoing PCS development:

.1 Feedback Channels: Establish regular feedback mechanisms to understand evolving user needs.

.2 Agile Development: Use agile methodologies for rapid response to feedback and stable feature releases.

.3 Training and Education: Offer regular user training and educate stakeholders on best practices.

.4 Innovation Exploration: Consider innovation labs for cutting-edge tech integration.

.5 Tech Advancement Evaluation: Assess AI, Blockchain, IoT for potential benefits.

.6 Performance Monitoring: Track system performance and optimize based on insights.

.7 Scalability Planning: Prepare for system growth with vertical and horizontal scaling.

.8 Redundancy and Security: Update backup and cybersecurity strategies regularly.

.9 Compliance Updates: Monitor regulatory changes and update the PCS for compliance.

.10 Stakeholder Engagement: Foster a collaborative community around the PCS.

.11 Documentation and Changelog: Maintain comprehensive documentation and provide changelogs.

.12 Sustainable Funding: Ensure a funding model to support ongoing development.

.13 Market Analysis: Regularly analyze market trends and competitor offerings.

.14 Pilot Testing: Test significant changes with select users for feedback.

These considerations, through ongoing activities, keep the PCS relevant, adaptable, and aligned with evolving needs and technological advancements while ensuring security in a rapidly evolving environment.

In the dynamic landscape of port operations, the implementation of a robust PCS is pivotal for enhancing efficiency, collaboration, and information exchange among various stakeholders. Developing a PCS involves careful consideration of several fundamental elements that collectively form the foundation for its successful establishment and sustainable growth. This annex explores the essential baseline considerations that should guide the development of a PCS, covering key aspects from the creation of a cohesive community to ongoing development efforts.

To sum up, designing a PCS that caters for users' needs, streamlines port and logistics operations, and fosters collaboration is paramount. To achieve this, prioritize end users, empathize with their pain points, and continuously gather feedback to enhance and adapt the system over time. In essence, PCS functionalities and services must remain user-centric, responsive to evolving demands, and finely tuned to ensure efficient port operations.

9 References

.1 Aydogdu, Y.V. and Aksoy, S., 2015. A study on quantitative benefits of port community systems. Marit Policy Manag, 42, pp.1-10.

.2 Baron, M-L. and Mathieu, H., 2013. PCS interoperability in Europe: a market for PCS operators? Int J Logist Manag, 24, pp.117-129.

.3 Carlan, V., Sys, C. and Vanelslander, T., 2016. How port community systems can contribute to port competitiveness: developing a cost–benefit framework. Res Transp Bus Manag, 19, pp.51-64.

.4 Chamber of Commerce and Industry of Western Australia (Inc), 2014. Port community system (PCS) summary—concise overview–November.

.5 Mthembu, S.E. and Chasomeris, M.G., 2022. A systems approach to developing a port community system for South Africa. Journal of Shipping and Trade, 7, Article number: 26. Available at: https://jshippingandtrade.springeropen.com/articles/10.1186/s41072-022-00128-3.

.6 UNECE. How To Develop a Port Community System: A Guide. United Nations Economic Commission for Europe. Available at: https://unece.org/fileadmin/DAM/trade/Trade_Facilitation_Forum/BkgrdDocs/HowToDevelopPortCommunitySystem-EPCSAGuide.pdf.

.7 UNESCAP, 2019. Report for Study on Facilitation of Port Community Systems. United Nations Economic and Social Commission for Asia and the Pacific. Available at: https://www.unescap.org/sites/default/files/Report%20for%20Study%20on%20Facilitation%20of%20PCS%20Dec%202019%20V2.pdf.

.8 https://unece.org/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf.

.9 https://unece.org/fileadmin/DAM/cefact/GuidanceMaterials/WhitePapers/WP-TechNoteSWTerminology_Eng.pdf

.10 https://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/single-window/compendium/swcompendiumvol1parti.pdf.

.11 https://unece.org/DAM/trade/Publications/ECE_TRADE_447E_CF-Rec37.pdf.