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RP07

GOVERNANCE & OPERATING MODELS



PHOTO BY: PCS OPERATOR | DPCS, DJIBOUTI

Executive Summary

A Port Community System Operator (PCSO) is responsible for establishing, managing, and enhancing the PCS. It serves as a trusted third party, enabling public and private stakeholders to share their data. It facilitates the seamless exchange of information among the port community. The role of a PCSO encompasses overseeing the design, development, integration, and management of digital port infrastructure within a single platform. This involves working closely with port stakeholders to ensure effective data collaboration, legal and regulatory compliance, and the adoption of new processes and technologies. The operator is responsible for managing the day-to-day operation of the system, port community management, customer service, maintenance, service level agreements and evolution of the PCS.

The PCS initiation phase could be either championed by the chief executive officer of the port authority, the Commissioner of the Customs Administration, or the president of the port community association. A key responsibility of the champion is to engage stakeholders, building trust within the public sector and the private stakeholders. Equally important will be the role of public sector executives of line ministries, such as the minister of transport or the minister of finance. Their engagement will be a key asset to the PCS project to drive change management at cabinet level.

The PCS initiator and operator could be the same or different entities. In most cases, the port authority initiates the PCS, with the intention of improving trade facilitation and the efficiency of port operations. In other cases, the private sector initiates the PCS, creating an entity seeking to streamline operations and reduce costs. The PCS can be operated by the initiator itself or by a third party.

PCS operator models center around three schemes. A public entity, a private entity or via a Public-Private Partnership (PPP) can operate a PCS. When operated by a government, it leads to increased public oversight and unfolds opportunities for leveraging existing public financial and human resources. The privately operated PCS could be more flexible and responsive to market demands. The PPP operator model balances public policy objectives and commercial interests, promotes joint involvement in the decision-making process and leverages technical expertise and financial resources across the board.

Operators require significant capital and operating finances. Capital expenditures are investments made in long-term assets, such as IT infrastructure, PCS application and offices. The amount of capital investment required depends on the size and complexity of the port, as well as the scope of the PCS system. Operating expenditure refers to ongoing costs of running the PCS and includes the salaries of employees, such as management team, data center and telecom engineers, customer service, marketing, communications, finance, and administrations, as well as costs associated with ICT infrastructure management and maintenance, cybersecurity, business continuity and evolution of the PCS.

The financial sustainability of operators ensures the long-term success of a PCS. Even though PCS development, maintenance and evolution costs could be included by stakeholders in the

port authority's budget or privately funded, many ports request the involvement of International Financial Institutions (IFIs). Their financial assistance could be coupled with upstream technical assistance to develop a digital gap analysis of the port sector to "lay the land" to develop a PCS road map, to design PCS functional and technical specifications, and advise during the procurement process. The latter can be crucial in supporting low and middle-income countries, as it allows them to develop PCS in situations where transaction volumes are modest, and the full cost might otherwise hinder competitiveness.

Risks can adversely affect the PCS development. Risks associated with initiating a PCS are summarized in five categories. They include legal and regulatory, institutional, public, and private stakeholders, and business planning risks. The PCSO must be aware of the challenges, apply effective risk management strategies to mitigate these risks and improve their performance. Tools they have at their disposal include the adoption of robust risk management strategies which encompass legal and regulatory compliance, effective public and private collaboration, cybersecurity, and business continuity.

Operators encounter resistance to change during the design, implementation, and evolution stages. Stakeholders may be hesitant to adopt new business processes and technologies, feel threatened by the potential loss of control, while- in many cases- the culture within the port community values tradition and established ways of working. The PCS initiator and operator should always pay attention to the legal and regulatory framework, develop clear digital strategies, foster stakeholder engagement, prioritize key areas for a PCS roadmap, select the right technology solutions, and measure overall progress. By using these tools and strategies, the operator can minimize resistance to change and ensure the PCS's success in the short to medium term.

A robust governance framework is essential, especially during the design and implementation stages. Without a governance structure, there is a risk of fragmentation, duplication, and conflicting priorities which could lead to delays, inefficiencies, increased costs, and failure. A robust governance structure helps to mitigate significant project development risks by establishing clear roles and responsibilities, decision-making processes, and mechanisms for resolving disputes and conflicts.

Human capital is fundamental for the efficient operation of a PCS. This refers to the skills, knowledge, and abilities of the people who initiate, operate, and use the PCS. The PCS project implementation team will require a wide range of expertise starting from maritime supply chain, functional and technical, legal, and regulatory, financial, and business planning, communication, and negotiations.

When established, the PCS's top management will play a crucial role in developing and implementing strategies, allocating resources, managing public and private stakeholders, monitoring performance, and driving innovation and continuous improvement.

1. Introduction

1.1. The context

The evolution of PCSOs began in the early 1980s. This marked the onset of a voyage that has led to significant developments within the industry on a global scale. Over the years, PCSOs have adapted to the changing demands of the port sector by embracing technological advancements and refining their operational models to better serve their port communities. Today, the affordability of technological solutions, the mounting pressure for improved operational efficiency and effectiveness and regulations have spurred a vast number of ports across the globe to consider the development and implementation of a PCS.

The development of PCSOs matches rapidly evolving industry demands. The need for specialized knowledge and skills necessitates dedicated professional management of these systems. The establishment of dedicated entities ensures better coordination and integration among stakeholders, streamlining the flow of goods and information, enables innovation and maximizes the use of available technology. PCS operating companies also allow for better governance and regulatory compliance by enabling focused oversight and implementation of policies and allocation of resources to maintain the security and integrity of these systems.

The increased need for collaboration is a key driver in the development of PCSOs. In the past, each stakeholder in the port community operated in silos, using their own proprietary systems. This led to inefficiencies, delays, and increased costs for all stakeholders. PCSOs have been crucial in promoting collaboration among stakeholders in the port community. They have helped break down the silos that existed between stakeholders, by providing a single platform for all stakeholders to exchange information and collaborate in real-time. This has led to improved communication and coordination among stakeholders, leading to more efficient and effective port operations.

Fast-paced technological evolution has a significant impact on the development of PCSOs. These advancements made it increasingly complex and challenging for port communities to develop, implement, maintain, and enhance a system on their own and paved the way for PCSOs to provide more comprehensive and sophisticated solutions. By leveraging cutting-edge technologies, such as cloud computing, AI, ML, IoT and blockchain, these companies address the evolving needs of port communities and help them stay ahead of the curve. As technology progresses on a global scale, PCSOs are anticipated to adapt and improve their operational modalities.

The rapid growth of the PCS has led to the emergence of a new market for solutions and service providers. The intense

competition among members of this burgeoning market serves as a catalyst for best practices, and technologically innovative PCS solutions. This competitive market is expected to drive down costs associated with PCS systems, making them more affordable and accessible for a wider range of ports. With lower barriers to entry, an increasing number of port communities can take advantage of the numerous benefits that a PCS can offer.

Operating models are not yet fully understood. Despite clear advantages of effective implementation, PCS initiators often find themselves grappling with the challenge of determining which operator model (public, private, or public-private partnership) is most suitable for their specific needs. This lack of knowledge can hinder their ability to make informed decisions and fully capitalize on the benefits of a PCS. Consequently, many initiators turn to international financial institutions for guidance and support in navigating the complex landscape of PCSO models. As the PCS industry continues to expand and evolve, it is becoming increasingly important for initiators to develop a better understanding of the various operator models available. By doing so, they can make informed choices that not only align with their unique requirements but also maximize the benefits of implementing a PCS in their respective port communities.

1.2. Outline and boundaries of the chapter

In this chapter we provide an in-depth analysis of operating models and the governance of a PCS. We examine management and administration aspects of models employed across various ports worldwide. We also define the PCSO and outline its role in the design, implementation, operation, and evolution of the PCS. This section analyzes the various models of PCSOs, including private operators, public operators, and hybrid models, and explores the advantages and disadvantages of each model. It also looks at typical risks that PCSOs face, including functional, technical, legal, regulatory, financial, and reputational risks, along with the strategies that PCSOs can use to mitigate them. However, our intention is not to present in detail the project cycle and procurement process of a PCS as this could be a very lengthy topic to cover.

Finally, it delves into governance issues, such as the role of different stakeholders, the need for collaboration and coordination, and the challenges of ensuring effective governance in a rapidly evolving technological environment. This chapter draws on case studies and is informed by real-world experiences, including emerging and developing countries which provide valuable insights into the challenges and opportunities.

2. The PCS Operator (PCSO)

A PCSO is responsible for the implementation, operations and management of a PCS. It provides a data collaboration platform that facilitates the exchange of information and coordination among different port stakeholders and serves as a neutral intermediary, ensuring that all parties can access the platform according to their roles and responsibilities in the maritime supply chain and that the system operates in a fair and transparent manner. A successful PCSO must have a deep understanding of the port industry, including the needs and challenges of different stakeholders. It must also have strong technical expertise and be able to manage complex systems which can handle large volumes of data in real-time. Finally, the management and staff of the PCSO must have excellent communication and collaboration skills to work effectively with different port stakeholders and ensure that the platform is continuously meeting their needs.

2.1. Role and responsibilities of the PCSO

It has become increasingly common for PCSOs to lead the design, development, operation, and evolution of the PCS. This approach to PCS implementation offers numerous benefits, particularly in terms of customization and cost-efficiency. By entrusting a single entity with the responsibility of designing, building, and operating the PCS, ports can ensure that the system is tailored specifically to the unique requirements of their operations and stakeholders. This bespoke approach allows for seamless integration of the PCS into the existing port infrastructure, leads to significant economies of scale and facilitates continuity between the different phases of the project, enabling a more cohesive and unified system.

The role of a 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:

- **Management:** It requires strong leadership from the top management, expertise in the maritime supply chain and collaboration with the public and private sectors to drive change management. Capacity to manage complex situations at all levels is key.
- **Design and development:** Strong technical expertise is required to design and develop a platform that is efficient, reliable, and secure. The system should be seamlessly integrated into the existing port digital infrastructure. The operator must be able to keep up with new technologies and continuously improve the system to meet evolving technology requirements.

Box 1. IPC as PCS Initiator

Israel is one of the cases where the development of a PCS has been a result of an orchestrated government action.

The 2005 Israeli port reform divided the Israeli Port Authority into four government-owned companies and one administration, namely the : (a) port companies of Haifa, Ashdod and Eilat, whose role is to operate commercial ports; (b) the Israel Ports Company (IPC), the ports landlord; and (c) the national regulator, the Administration of Shipping and Ports (ASP)

To avoid the risk of having different procedures and data requirements among the four port companies, IPC management decided to take the digital developments to the next level and set up the Israeli Port Community System (IPCS).

To achieve maximum cooperation from the stakeholders it was decided to establish a port community Steering Committee to approve the IPCS roadmap and annual plans. A Working Forum was also formed to discuss and harmonize procedures, set digitalization standards and coordinate IPCS implementation steps.

Most importantly, it was decided that the organization, which will design, develop, operate, and maintain the PCS is IPC. IPC CIO was assigned as the project manager, reports to the steering committee and acts as the head of the Working Forum.

Source: Israel Port Company.

- **Operation:** Effective, accurate and secure handling of vast amounts of data flowing through the system daily is a critical responsibility for PCSOs. This meticulous data management involves regularly updating records and time stamps to reflect the most current information, which is crucial for smooth coordination between different parties within the port community.
- **Maintenance and support:** Once the platform is up and running, the PCSO must provide ongoing maintenance support. This ensures that the system always remains operational. This includes monitoring the system for any issues, promptly addressing them, and providing customer service and technical support to users as needed. It must also ensure that the system is regularly updated with the latest security patches and software updates and includes a change control board to manage any changes to the system.

- Sustainability:** A PCS is generally rolled out over time, with new services and extension up to a multimodal and national environment in some cases. The introduction of new services and business processes may be driven by new regulations and private stakeholder requirements. The PCSO is a short to long term project where human capital, project financing, digital infrastructure, legal and institutional frameworks need to be assessed regularly.

The PCS is a data orchestrator. To ensure that the PCS is effective, it should not be developed in isolation from other digital systems already operating in the port and maritime sector.¹ Instead, the PCS should play the role of digital integrator and orchestrator. This means that the PCS should be designed to be interoperable with existing port, maritime and border management back-office systems, leveraging their functionalities. Moreover, the interoperability of the PCS with other single window platforms, such as MSW and TSW, can help to streamline trade and transport facilitation processes further,² It is important that the PCS designer conducts digital mapping and a gap analysis to achieve these goals. In many cases, the World Bank has provided technical assistance to identify the scope and functionalities of existing digital port infrastructure and identify gaps that can be filled by single window platforms such as a PCS.

The PCSO provides critical information infrastructure. Ports are critical infrastructure in national security. As a result, PCSOs are also considered critical information infrastructure. They play an important role in the resilience of the maritime supply chain nationally and globally. As a result, this requires ad hoc compliance to ensure the resilience of that critical infrastructure.

A successful PCSO must have several qualifications. These include deep technical expertise, superb communication skills, and a willingness to continuously innovate. A successful operator must have a deep understanding of the technical systems and processes used in port operations, including data management systems, software applications, and hardware infrastructure. It must also be familiar with the different standards and regulations related to the industry, international trade laws and customs processes and procedures. It is imperative to be able to communicate clearly and efficiently with all stakeholders in the port community and to possess the ability to meet their needs. Finally, as the port industry constantly evolves with recent technologies, regulations, and novel business practices, a successful PCSO must be willing to continuously seek out new and innovative solutions to improve. This can involve everything from exploring new business processes, software applications and hardware solutions to developing new communication protocols and data management systems.

The PCSO plays a critical role in leading change management and overcoming resistance to change. With the support of the appropriate governance framework (discussed later), the PCSO can manage change effectively and ensure that the digital transformation delivers value to all stakeholders. PCSOs face intense resistance to change. Some stakeholders may be hesitant to adopt new processes or technologies because they are unfamiliar with them and uncertain about how they will affect their work. Others fear loss of control, which is particularly true in a port community context, where some stakeholders have established legacy modus operandi which offers them power and control over others. Finally, if the culture within the port community places a high value on tradition and established ways of working, stakeholders may be reluctant to embrace new technologies or processes.

The PCSO is a change leader. The PCS is not only about technology but about people who drive change and are ultimately more important than the system itself. Given the nature of day-to-day operations, the PCSO can take concrete actions to lead change management by developing a clear change management plan, communicating effectively, and building a culture of continuous improvement. By building a strong coalition of stakeholders, the PCSO creates buy-in and ensures that all parties are aligned and committed to the change management process. This effort also yields opportunities to communicate the benefits of change, highlights potential benefits for each stakeholder, and provides regular updates on progress and next steps. The PCSO should develop a road map and plan that outlines the specific steps needed to improve efficiency, enhance data management systems, and implement new technologies. The plan should also include KPIs for measuring progress and evaluating business impact on the supply chain. The PCSO can take the lead in promoting a culture of continuous improvement that values innovation, experimentation, and learning. This includes creating opportunities for stakeholders to share feedback and ideas and encouraging experimentation with new solutions. When a PCSO opts to sub contract part of its operations, such as the development of PCS services, it must still recruit a workforce ready to take over at the time of hand over and organize the knowledge transfer as part of the procurement process.

While technology and infrastructure are critical components of a PCS, human capital is also essential for the efficient operation of a PCSO. Human capital refers to the skills, knowledge, and abilities of the people who manage, operate, maintain, and use the PCS. Staffing will include executive management and employees of departments, such as port community relations, operations in charge of the technical infrastructure and application infrastructure, customer service, communication, finance, administration, and human resources. Depending on the size

¹ Such as Terminal Operating System (TOS), Customs Information Systems (CIS), Vessel Traffic Management System (VTMS), Terminal Truck Management System (TTMS) or Warehouse Management System (WMS) to name a few.

² More information on the relationship between PCS, TSW and MSW is found in Chapter 9

of the national economy and the PCSO model, PCSO staff may range from 2 to more than 200 people. This excludes external staff from subcontractors, notably for the initial design and development of PCS services.

The role of the CEO in the development and operation of a PCS is crucial. He or she is responsible for setting the vision and direction of the organization and ensuring that the PCS is aligned with overall business strategy and values. As leader, he or she must have expertise in the maritime supply chain. His or her capacity to manage complex situations at all levels

is vital. CEOs can contribute to the development and operation of a PCS by providing strategic guidance and overseeing the implementation of technology solutions. Equally important, they must hire the right management team and staff. It is important to highlight that the success of a PCS ultimately depends on the people involved, rather than just the technology or systems used. Effective collaboration and communication among stakeholders are essential for the development and operation of a PCS. Therefore, top management should prioritize building relationships and fostering a culture of collaboration among all parties.

3. The spectrum of PCSO models

3.1. Initiation of the PCS project and the PCSO

3.1.1. The role of key executives as champions of the PCS project

Successful PCS projects are rooted in strong leadership. Their capacity to engage and to collaborate with public and private stakeholders for the common good of the port community is essential. Their motivation must be driven by various pain points and bottlenecks that the port, Customs, port community, shippers, and cargo owners have been facing for the last four decades. The engagement of the CEO of the port authority, the Commissioner of Customs and the President of the Port Community Association at the inception stage is essential:

- **Rotterdam:** The early driving force for the establishment of Port Infolink PCSO (that later became Portbase) was the chief operating officer (COO) of the Port of Rotterdam. He understood that isolated different individual initiatives would not lead to a broad-based and the whole port encompassing answer to the digitalization challenges. The Port of Rotterdam Authority, having a neutral status, was chosen by the COO to pioneer a broad structural solution because it was the only entity accepted by the maritime port environment to do so.
- **Jamaica:** The Director General of the Shipping Association of Jamaica built momentum in the 2000s with the private and public sector. Then, the Commissioner of Jamaican Customs became a key catalyst by the end of the decade, along with the Shipping Association of Jamaica and the Port Authority of Jamaica. The PCS became a key driver for the implementation of the WCO SAFE Framework of Standards to Secure and Facilitate Global Trade. One important action that drove the future of Jamaica's PCS was that the Commissioner of

Customs led a PCS European tour with key stakeholders. This created a common vision and understanding of the impact of PCS on trade. It also demonstrated how collaboration could build trust between the parties. This was critical to the success of the PCS. The Commissioner later handed over to the CEO of the Port Authority of Jamaica to de-risk and implement the project.

- **Mauritius:** The Comptroller of Customs, just a couple of weeks after endorsing the SAFE Framework of Standards at the WCO Council in 2005, engaged the Director General from the Mauritius Exporter Association to co-lead the way forward of the PCS project. MEXA's Director General engaged key shippers, trade associations of the port community, and key ministers on the port community digitalization agenda. The Director General drove the inception phase of the PCS project until the creation of MACCS, the PCSO of Mauritius. The Director General's capacity to engage in a dialogue, collaborate, build consensus and, above all, involve the ministers and their permanent secretaries proved the foundations of true public partnership.
- **New Caledonia:** The President of the Freight Forwarder Association was the champion of the PCSO in New Caledonia, bringing not only stakeholders gradually around the table, but also taking over the project by financing through the private sector to make the PCSO a reality. Over time, the collaboration with Customs enabled an amendment to the Customs code, providing critical provisions such as the mandatory use of a PCS to comply with customs requirements.

Change leaders are required to drive PCS projects from inception to implementation and operation. Executives at public and private bodies (listed above) have proved critical as both visionaries and leaders of change. They have served the interests of their port communities, boosting domestic and international trade.

Figure 1. PCS initiator typology

Source: Authors.

3.1.2. Initiation of the PCS Operator

Public agencies have a leading role in PCS initiation. There is a widespread misconception that the creation of a PCS is the sole result of a private sector initiative. This is not entirely accurate. Public agencies have a leading role in the envisioning and conceptualization of a PCS. Port authorities, and to a lesser extent Customs authorities, play a multifaceted role in the development of a PCS. They provide leadership and strategic direction to bring all the stakeholders together. This helps to create a framework for collaboration and facilitates the formation of partnerships between the private sector and government agencies. In distinct cases, they also provide the necessary funding

and resources to develop the digital platform. Figure 1 presents examples of PCS projects initiated by governments:

The only purely private sector PCS initiators were the ones founded early on in Europe. These include the ports of Hamburg, Bremerhaven and Felixstowe. These are the oldest PCS solutions globally. DAKOSY was the first PCSO in the world in 1982. It was created by port community associations at the Port of Hamburg: DIHLA shipping agents association, DIHS freight forwarders association and DHU terminal and CFS operators' association.

Relationships between PCS champions and operators may vary. Their relationship varies depending on the specific circumstances

Figure 2. Examples of PCS projects initiated by government entities

Source: Authors.

of each port. In some cases, the champion and operator may be the same entity, such as a CEO of a port authority leading the initiative and the port authority that envisions, designs, builds and manages the PCS. Similarly, the PCS initiator may also be the president of the port community or shipping association. Figure 2 presents various entities that may be considered as engaged at the PCS initiation stage. When the initiators represent different entities, it is essential to establish clear lines of communication and collaboration to ensure that the PCS project functions effectively.

3.2. Exploring PCS models

There are different PCS models to explore: Public, Private, and PPP. A PCSO can be developed based on the following three operating models: the public, the private, and the public-private partnerships. The core characteristics of each model, the criteria behind the selection, the common elements shared by the three, and the most popular model among members of the International Association of Ports and Harbors (IAPH) and the International Port Community Systems Association (IPCSA) are outlined in the following paragraphs. A schematic representation of the operational models is found in Figure 3 below.

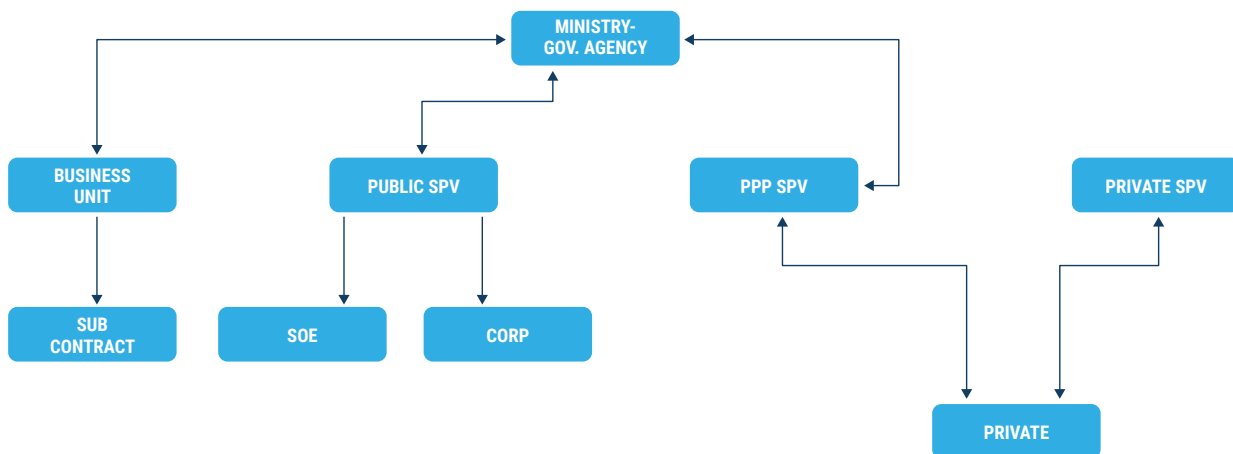
A government-led approach to the PCS: The public model of a PCS is characterized by its complete ownership, funding, and management by a governmental body. Under this model, the PCS is viewed as a public good or utility, serving the needs of all stakeholders in the port community without discrimination. The government is responsible for the development, maintenance, and enhancement of the PCS, and it can act as an impartial and unbiased authority to address any potential conflicts or issues. The public model is often chosen by countries where the government plays a significant role in the economy or wants to have direct control over the port infrastructure for strategic or regulatory reasons.

Private management of the PCS: The private model of a PCS, on the other hand, is owned, financed, and managed by private entities or consortiums, often comprising key stakeholders, such as port community associations, freight forwarders' associations, Customs brokers' association, shipping agents' associations and terminal operators. This model is driven by the need for operational efficiency and the potential to generate profit based on invested capital. It often results in a competitive landscape, fostering innovation and encouraging the adoption of cutting-edge technology. The private model is typically selected by countries with a strong market-driven economy or where the private sector has demonstrated expertise and capacity to manage complex port operations efficiently.

Sharing responsibilities under the PPP model: The public-private partnership (PPP) model of a PCS is a hybrid approach, where the government collaborates with private entities to share the responsibilities and risks associated with the development, management, and financing of the PCS. This model aims to leverage the expertise and efficiencies of the private sector while maintaining public oversight and control to ensure that the PCS serves the broader interests of the port community. The PPP model is often chosen by countries seeking to strike a balance between public and private interests and capitalize on the strengths of both sectors.

How PPPs empower a PCS: Many argue that the most appropriate operating model for a PCS is PPP as the one that strengthens collaboration among the members of the port community. In fact, the PPP model fosters a collaborative environment, which is crucial for the success of a PCS. A PCS requires the participation of various stakeholders and by bringing both public and private entities together, the PPP model creates a platform for these stakeholders to collaborate and share the responsibilities of implementing and managing the system. This collective approach encourages open communication and trust among the parties, leading to a more effective and efficient PCS.

Figure 3. Spectrum of PCS Operating Models



Source: Authors.

Additionally, the PPP model combines the strengths of both public and private sectors, which can lead to a more successful and sustainable PCS. The public sector provides regulatory support and ensures that the PCS complies with national and international standards, while the private sector contributes technical expertise, innovation, and capital investment. This combination of resources results in a more robust and resilient PCS that can adapt to the changing needs of the maritime industry.

Model commonalities and global preferences: Despite the differences among these models, there are several common elements shared by all three. Each model aims to optimize the flow of information and goods, enhance collaboration among stakeholders, and improve overall port efficiency. Additionally, all three models must abide by international regulations and standards to ensure the security, safety, and environmental sustainability of port operations. Among members of the IAPH and IPCSA, the historical popular operating model is the public-private partnership. But in the last decade the public sector, led by port authorities, has increasingly played a leading role.

Port authorities can foster trust and collaboration: The role of a port authority in managing PCS data is of paramount importance. They act as neutral and trusted third parties and as a “data steward” ensuring the confidentiality and security of shared information. This is mainly attributed to their impartiality, as they are not directly involved in commercial transactions or competing with the stakeholders who rely on the PCS. This neutrality allows them to act as unbiased facilitators, ensuring that the exchange of data and communication within the PCS is carried out transparently and without prejudice. Port authorities, under certain conditions, could reduce the risk of PCS project implementation. The port authority’s clear role is even empowered as the resilience of the critical information infrastructure becomes a mandatory requirement around the world.

Gaps in understanding PCSO models remain: The different operating models for a PCS are not yet fully understood, leading to the creation of challenges for initiators in determining which model is most suitable for their specific needs. The lack of understanding hinders their ability to make informed decisions and benefit from PCS advantages. As a result, initiators often seek guidance and support from international financial institutions to navigate the complex landscape of PCS operator models. With the PCS industry expanding and evolving, it is increasingly vital for initiators to develop a better understanding of the available operator models. By doing so, they can make informed choices that align with their unique requirements and maximize the benefits of PCS implementation in their respective port communities.

3.2.1. The public model of Port Community Systems

Public model ownership and control: The public model serves as a crucial framework for managing the exchange of information and communication among port and maritime industry stakeholders. Under this model, the government (or a public entity such as the port authority) is responsible for establishing, funding, and maintaining the PCS, ensuring that the system aligns with national interests and public policy objectives. Ownership and control in the public model rest with the government or a public agency, which guarantees that the system adheres to national interests, public policy, and regulatory requirements. The initial investment and ongoing operational costs are funded through public resources, such as taxes or government budgets. This stable funding source can provide long-term support for the development, maintenance, and evolution of the system. The public model is the most predominant of the past decade.

Development under a ministerial or governmental agency business unit: Under the fully public model, the PCS is considered a public good or utility, serving the needs of all stakeholders in the port community without discrimination. The government assumes full responsibility for the development, maintenance, and enhancement of the PCS, and it acts as an impartial and unbiased authority to address any potential conflicts or issues. This model provides the government with direct control over the port infrastructure, allowing it to oversee the implementation of regulatory frameworks, promote public safety and security, and ensure the long-term sustainability of the port operations.

The Special Purpose Vehicle (SPV) for a PCS in public hands: An SPV is a legal entity created for a specific purpose or project, often used in infrastructure projects where there is a need for dedicated funding, management, and operation. In the context of a PCS, a fully public SPV model is one where the platform is owned, funded, and managed entirely by a government body, typically a port authority. Under this model, the PCS is viewed as a public good or utility, serving the needs of all stakeholders without discrimination. The government through the SPV is responsible for the development, maintenance, and enhancement of the PCS, and it can act as an impartial and unbiased authority to address any potential conflicts or issues. In this way, the fully public SPV model can provide a stable and reliable platform for collaboration among various stakeholders, ensuring that the PCS serves the broader interests of the port community.

There are two formations of the public SPV PCS:

The fully public SPV model can take two forms: a state-owned enterprise (SOE) or a corporatized entity.

- **A state-owned enterprise:** In the context of an SOE, the PCS is owned and managed directly by the government, and it operates as a public service. This model is often chosen by countries where the government plays a significant role in the



economy and has direct control over port infrastructure for strategic or regulatory reasons.

- In the **corporatized entity model**, the PCS is owned by the government but managed and operated by a separate legal entity, such as a public corporation i.e., a corporatized port authority. This model allows for more flexibility in terms of management and operation, as the PCS can operate under a separate governance structure with more autonomy in decision-making. Additionally, a corporatized entity can access private sector expertise and funding, which can help to drive innovation and efficiency in the PCS.

Aligning a PCS with public policy objectives: One of the primary advantages of the PCS public model is the alignment with public policy objectives. Since ownership and control in the public model rest with the government or a public agency, the system is designed to adhere to national interests, public policy, and regulatory requirements. This ensures that the PCS serves the broader interests of society and the economy. Additionally, the government's involvement in the development process ensures that the system aligns with broader national strategies, such as promoting trade facilitation, boosting economic growth, and enhancing national security. Another advantage of the public model is the stable funding source provided by public resources, such as taxes or government budgets. This provides long-term funding support and ensures that the PCS remains operational even during times of economic uncertainty. However, several public PCSOs are defined as a public service to the maritime supply chain.

Government oversight and trust: The public model also provides a high degree of control and oversight to the government or public agency responsible for its management. This ensures that the system operates in compliance with regulatory requirements and public policy objectives. The government's involvement in the development process also helps to address potential issues related to privacy, security, and data management. This level of control and oversight contributes to the trust and confidence stakeholders have in the system and its operations. Furthermore, the public model fosters a collaborative environment that encourages open communication and collaboration essential for effective decision-making, problem-solving, and resource sharing.

Challenges of the public PCS model include political influence: However, the public model faces several challenges, including bureaucratic inefficiencies, limited resources, and potential political interference. The decision-making process is often subject to bureaucratic procedures and political influence, which may slow down the implementation of new features or system upgrades. This can result in a system that is less responsive to the rapidly evolving needs of the port community. Furthermore, government budgets can be constrained by competing priorities, which may limit the resources available for investing in and maintaining the PCS. This may lead to outdated technology, inadequate system maintenance, or a lack of necessary upgrades, ultimately reducing the overall effectiveness and efficiency of the PCS. Moreover, the public model is susceptible to political influence, which could result in decisions that prioritize short-term political gains over long-term efficiency and effectiveness. This could lead to a lack of innovation and stagnation within the PCS, preventing it from

keeping pace with the evolving needs of the port community and global technological developments.

Improving the public model of the PCS: Despite these challenges, there are opportunities to improve the public model of PCS. Streamlining decision-making processes and implementing more efficient procedures can help to reduce bureaucratic delays and ensure that the PCS remains responsive to the needs of the port community. Engaging with private sector expertise can drive innovation and efficiency within the public model while maintaining public accountability and oversight. Lastly, exploring alternative funding models, such as user fees, can help to ensure the long-term financial sustainability of the PCS.

Case studies: In the last part of the Global PCS study (see Chapter 13) we are introducing PCSOs championed by the public sector, aiming at the creation either of a new business unit, such as Jamaica's PCS at Port Authority of Jamaica, Silogport PCS at the Port of de Valparaiso or Busan PCS; or a nonprofit private corporation, such as Portbase in the Netherlands for the Port of Rotterdam and Port of Amsterdam and an SPV, such as Djibouti PCS and the India Port Association PCS.

3.2.2. The private model of Port Community Systems

The private PCS model represents an alternative approach to managing information and communication between stakeholders in the port and maritime industry. In contrast to the public model, the private model entrusts a private company or consortium with the responsibility of developing and managing the system. Under the private model, ownership and control of the PCS lie with a private entity or a group of private stakeholders. This allows for more flexibility and adaptability in responding to industry trends and stakeholder needs. The initial investment and ongoing operational costs are financed by the private entity or consortium, with profits generated through user fees or subscription-based services. The pricing strategy adopted by private PCS models is typically market-driven, which could lead to higher costs for certain stakeholders. Access to the system may also be limited based on contractual agreements or membership criteria. Decision-making in private PCS models tends to be more agile and responsive to market demands, with accountability primarily to shareholders and stakeholders, and less emphasis on public scrutiny and procurement processes.

The strengths of the private model are manifold. First, the model encourages innovation and efficiency, as private companies are motivated by profit and competition to develop and implement cutting-edge solutions. This can lead to the rapid introduction of new features, system upgrades, and improvements in response to changing industry demands. Second, the private model benefits from agile decision-making processes that are not encumbered by bureaucratic procedures and political influence that can slow down public systems. This allows the private PCS to

Box 2. DAKOSY's PCS Transforms the Port of Hamburg

The Port of Hamburg, one of the busiest ports in Europe, utilizes a port community system (PCS) developed and operated by DAKOSY AG. DAKOSY, a private company, also operates the Cargo Community System for Frankfurt and Hamburg airports,

The Hamburg PCS has played a vital role in streamlining the port's operations by facilitating the exchange of information among port stakeholders.

To foster this collaborative environment, DAKOSY has established a governance structure that includes representatives from key stakeholder groups. This approach ensures that all parties have a say in the decision-making process and that the PCS evolves to meet the changing needs of the maritime industry

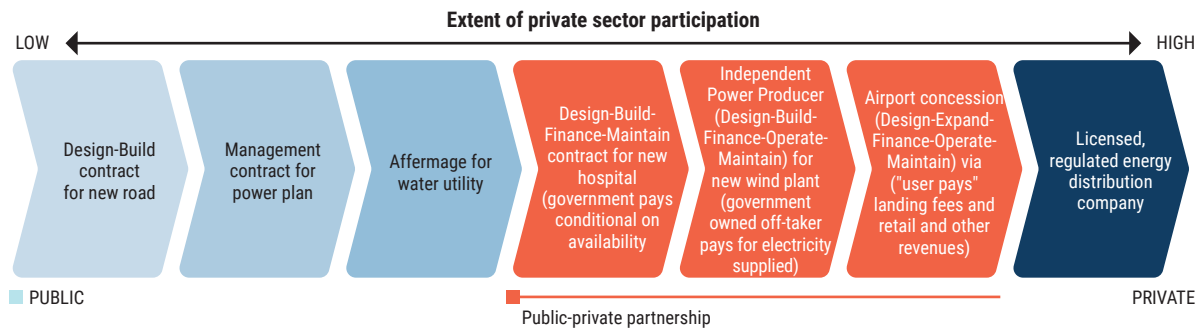
As a private company, DAKOSY has the flexibility to invest in cutting-edge technology and innovative solutions. They offer a range of services through their PCS, such as cargo tracking, customs clearance, electronic documentation, and container management. By providing these services, the PCS enhances the efficiency of port operations, reduces administrative burden, and minimizes errors.

Moreover, DAKOSY continually invests in research and development to stay ahead of industry trends and technological advancements. This enables the company to provide scalable and adaptable solutions that can meet the growing demands of the Port of Hamburg and other ports using their PCS

Source: DAKOSY.

be more responsive to the needs of stakeholders and to adapt quickly to changes in the market. Third, the private model can attract investment from the private sector, which can help drive technological advancements and expand the capacity of the PCS.

The private model may prioritize short-term profits over long-term public interests, potentially compromising regulatory compliance or national security concerns. Private companies may also prioritize more lucrative customers or restrict access based on membership requirements. This can result in unequal access to the PCS for smaller or less well-funded stakeholders, potentially impeding cooperation, and coordination within the port community. Additionally, the market-driven pricing strategies employed by private models may lead to higher costs for certain stakeholders, impacting affordability and adoption rates.

Figure 4. Examples of PPP contract types

Case studies: In the last part of the Global PCS study (see Chapter 13) we are introducing PCSOs championed by the private sector, such as in Singapore and GIPANC in New Caledonia. These are similar to early adopters of PCSOs in Germany and the UK in 1980s.

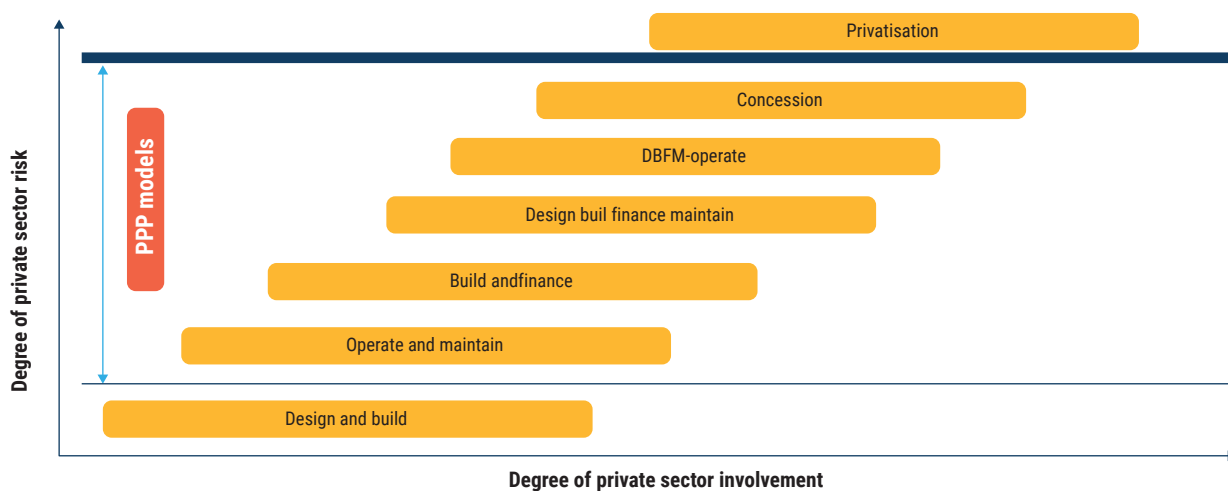
3.2.3. Public-private partnerships in Port Community Systems

Partnerships for successful PCS implementation: The implementation of a PCS has been recognized as a mutually beneficial approach, bringing savings and value to all stakeholders involved. However, the process of establishing a PCS can be both challenging and costly. The risks associated with large-scale ICT projects must be considered, along with the need to align the regulatory procedures of all participating government agencies. Public-private partnerships (PPPs) have been used effectively to implement PCS solutions in different regions and economies. PPP represents a collaboration between government entities and private companies or consortia, with the aim of sharing the responsibilities of developing, financing, and maintaining a

PCS. There are several PPP types that can be applied, as shown in Figure 4.

In the context of PCS development, the most popular type used is the design-build-finance-operate-maintain (DBFOM) model. Overall, the PPP model offers a balanced approach, ensuring that the PCS remains aligned with public policy objectives while benefiting from private sector expertise and market-driven innovation. Table 1 offers a list of countries that implemented a PCS under the PPP model.

Advantages of the PPP Model: A key advantage of the PPP model is the shared ownership and control of the PCS. This allows the system to benefit from both government oversight and private sector agility. By involving both public and private stakeholders in decision-making processes the PCS can better address the diverse needs and priorities of the port community, while ensuring compliance with national regulations and public policy goals. Funding is another crucial aspect where the PPP model strikes a balance. Under this model, both the public and private partners contribute to the initial investment and ongoing

Figure 5. Degrees of private sector participation

operational costs. This shared financial responsibility reduces the burden on taxpayers and provides a more sustainable funding structure.

Furthermore, private sector involvement can help attract additional investment, which may be crucial for PCS development and expansion. In terms of access and pricing, the PPP model, when structured right, aims to ensure equitable access to the PCS for all port stakeholders, while adopting a competitive pricing strategy that maintains financial sustainability. Additionally, this model makes decision-making more efficient and transparent. Decision-making benefits from the agility of private sector management, while remaining accountable to public interests and regulatory compliance. The inclusion of private partners in the decision-making process can lead to faster and more efficient implementation of new features and system upgrades. At the same time, public accountability ensures that the system operates transparently and in the best interest of all stakeholders.

Challenges of the PPP model: The PPP model is not without challenges. It requires careful negotiation and well-structured agreements to ensure a fair distribution of responsibilities, risks, and rewards among the partners. Moreover, the success of the PPP model depends on maintaining a strong working relationship between the public and private partners, built on trust, communication, and a shared vision for the PCS.

One of the most obvious challenges of implementing PPPs for the development of a PCS is the complexity of the project itself. A PCS involves integrating various systems, including logistics, Customs, and security, and requires the participation of multiple stakeholders, such as shipping lines, freight forwarders, and terminal operators.

The coordination and alignment of the interests of all these port, maritime and border agencies can be difficult to achieve, especially where private partners may have conflicting goals with the public sector. In addition, these projects are often long-term, which means that changes in technology and the business environment can change during the project's lifespan. Therefore, PPP agreements must be flexible enough to allow for adjustments and adaptations to keep up with the changes in the business environment.

Another challenge is ensuring that costs and benefits are equitably distributed among partners, since private partners seek to maximize their profits, while the public sector prioritizes the overall development of the port community. Therefore, it is crucial to set clear objectives, incentives, and accountability mechanisms that balance the interests of both parties. While PPPs have become an attractive option for financing and managing infrastructure projects, developing a PCS through PPPs requires careful consideration of the challenges and risks involved. The success of a PPP for developing a PCS depends on careful negotiation and well-structured agreements that ensure a fair

distribution of responsibilities, risks, and rewards among the partners. The knowledge gap is usually found on the public sector side. Often it seeks technical assistance and expertise from international organizations to negotiate the PP contract. The World Bank has provided upstream support to government partners for the development of PCS and other single window platforms.

However, some forms of PPPs have faced challenges related to anti-trust laws in the last decade. This is the case when port community professionals are shareholders in a PCSO.

Despite this success, questions remain regarding the right approach to PPP implementation for a PCS. It is crucial to consider the essential points when contemplating a PPP option, including risk management, clear objectives, and mutually beneficial outcomes for all stakeholders involved. By taking these factors into account, implementing a PCS through a PPP can create a beneficial system for all parties involved.

Case studies: In the last part of the Global PCS study (see Chapter 13) we are introducing PCSOs as PPPs, such as Portnet Morocco and SEGUCE DRC.

3.2.4. Concessions

The first PCSO concession agreement was developed in the early 2010's, based on terminal operator concession practice. Successful concessions are based on fair balance between the Concessioning authority and the Concessionaire and sometimes not all improvements in ports have been passed on to the shipper in terms of lower prices or better services. For this reason, the PCSO concessions need to be better planned and implemented. This section will introduce key guidelines about PCSO concession agreements.

A specific case of PPP for a PCSO is when it is managed by a special purpose vehicle (SPV) under a public-private partnership, which is responsible for PCS design, building, finance, operation and maintenance, under a concession agreement. Both public and private shareholders contribute to the financing and assets are transferred back to the concessionaire at the term of the concession, or by a private corporation under a public-private partnership principle, that is responsible for PCS design, build, finance, operation, and maintenance under a concession agreement and assets are transferred back to the concessionaire at the term of the concession.

Commonly, the concessioning authority put in charge by the government could be a government ministry, such as the Ministry of Transport, or the national port authority. It is given the power to design, build, finance, operate and maintain operations among other things. Its main purpose is to facilitate and secure the country's trade.

Table 1. Country examples of the PPP business models for a PCS

Barcelona (1999)	PORTIC	Port Authority of Barcelona Banc Sabadell Caixa Bank Chamber of Commerce of Barcelona
Mauritius (2007)	MACCS	State Investment Corporation Mauritius Port Authority Cargo Handling Corporation Mauritius Exporter Association Mauritius Chamber of Commerce and Industry Shipping Agents Association Customs House Brokers Association Freight Forwarders Association SOGET
Morocco (2011)	PORTNET	National Port Authority MARSA Maroc Other Private Operators (tbc by Youssef)

Source: Authors.

The concession agreement should grant the concessionaire a sole and exclusive right to the design, build, finance, operation, and maintenance (DBFOM) of the PCS, as well as providing services for the duration of the concession period.

For this exclusive right and obligation, the concessionaire should pay concession fees to the concessioning authority. The concessionaire would accept the concession and agree and undertake to implement the project at its own cost and risk in accordance with the project requirements, the applicable laws, and the provisions of the concession agreement.

The concessioning authority should implement a competitive bidding process. After evaluating all the proposals received by it from the applicants, it should award the concession to the successful bidder. The successful bidder would be required to incorporate a special purpose company to undertake the concession.

Understanding key assumptions will ensure the concessioning authority can make a detailed evaluation of the financial offers from the bidders for the life of the project. Benefits and pitfalls should be considered when determining the applicable business model for the concession when it comes to procurement of concession, implementation, and acquisition of shares.

Finally, a PCSO concession is an opportunity for international financing institutions to participate in the project by financing. This was the case for terminal operator projects in the last 20 years in Latin America, Africa, Middle East, and Asia Pacific. The concession advantages related to the procurement of concession implementation are listed below:

Royalty: The Concessionaire would be granted the concession for the period stated in the request for proposal. As compensation for the concession, the Concessionaire would pay the Concessioning Authority periodic royalties, being a percentage of the turnover achieved by the Concessionaire. The royalty payments would ensure a consistent cash flow to the concessioning authority.

Project risk: The Concessionaire carries the full risk of the project and the concessioning authority's risk is limited to a decrease in royalty payments and replacing a Concessionaire in case the incumbent Concessionaire is not performing in terms of the concession.

Limited oversight requirements: The concession takes the form of a DBFOM project, which means that the Concessionaire would take full responsibility for the operations of the PCSO. Accordingly, limited oversight would be required from the concessioning authority: namely, to review the periodic operational reports and financial statements presented by the Concessionaire. The concessioning authority would lead the institutional and legal governance framework.

Procurement Process: The procurement process can be undertaken under a public procurement process or a private internal procurement act. This means that the concessioning authority may use the procurement process or utilize the national public procurement processes, as legislation may dictate. The concession disadvantages related to the procurement of concession implementation are listed below.

Lack of operational transparency: The Concessionaire would have full operational control of the PCSO and would provide operational reports and financial statements periodically to the concessioning authority. Accordingly, the concessioning authority would not have detailed insight into the daily operations of the PCSO, which could cause a lack of transparency.

Transfer of business: At the end of the concession period, the Concessionaire would be required to transfer the PCS environment to the concessioning authority. This would include the transfer of intellectual property, third party licenses and data center services. The transfer would also require the co-operation of third parties. Such cooperation can be specified as a contractual obligation for the concessionaire. However, enforcement against third parties, if required, would not be seamless.

If the shares in the Concessionaire can be transferred directly to the concessioning authority, the intellectual property, third party licenses and data center services and other contracts with contractors will automatically be transferred with the shares.

Benefits and pitfalls should be also considered when determining the applicable business model for the concession, when it comes to share acquisition by the concessioning authority in the Concessionaire. Concession advantages related to share



PHOTO BY: PCS OPERATOR | DPCS, DJIBOUTI

acquisition by the concessioning authority in the concessionaire are listed below.

Board representation: If the concessioning authority acquires shares in the Concessionaire, the concessioning authority can request a seat on the board of directors of the Concessionaire. Board representation will provide the concessioning authority with detailed insights into the operations of the Concessionaire and promote transparency.

Dividends: As a shareholder of the Concessionaire, the concessioning authority would be entitled to dividends if the Concessionaire makes a profit and decides to distribute dividends to its shareholders. The receipt of dividends may provide a tax advantage to the concessioning authority. However, this position would need to be confirmed by a tax expert, taking into consideration the entire financial model of the concession.

Transfer of shares: At the conclusion of the concession period, the Concessionaire would have the obligation to transfer the PCS environment to the concessioning authority. If the transfer is implemented through the transfer of a 100% shareholding in the Concessionaire to the concessioning authority, it minimizes the risk of requiring the cooperation of third parties contracting with the Concessionaire.

Additionally, as the concessioning authority was already a minority shareholder and held a seat on the board of the Concessionaire, it will have an insight into the operations of the Concessionaire. It will minimize the risk of taking ownership of the Concessionaire by the concessioning authority. Concession disadvantages related to share acquisition by the concessioning authority in the concessionaire are below.

Capital contribution: As a shareholder in the Concessionaire the concessioning authority may be required to make capital contributions to the Concessionaire. This happens when capital is required from the shareholders of the Concessionaire. To the extent that the concessioning authority is not able to contribute its portion of capital, this may lead to a threat of equity dilution or the creation of unequal shareholder loans, which will both have a direct impact on future dividend distributions.

PPP legislation: Should the concessioning authority obtain an equity interest in the Concessionaire, the risk in the project will be shared between the Concessionaire and the concessioning authority which could define this project as a public private partnership. In such an event, public private partnership legislation may be activated, which would govern various aspects of the project and increase the bureaucratic processes required to implement the project.

It is not uncommon for a public entity to take an equity interest in projects of national interest. For purposes of the procurement process, bidders may be requested to address the following as part of their financial proposal to the Request for Proposal, namely free carry shareholding in the Concessionaire available to the concessioning authority and additional shareholding in the Concessionaire available to purchase by the concessioning authority throughout the Concession Period.

When the concessioning authority decides to acquire shares in the Concessionaire, it is important that a shareholder's agreement is concluded between them. This helps to reduce various risks. It may be prudent to include a template shareholders agreement as part of the Request for Proposal.

Finally, the concession agreement should address at least the following subjects:

- Definitions and interpretation.
- Concession.
- Conditions precedent.
- Performance guarantee.
- Scope of the project.
- Obligations of the parties.
- Transaction fees chargeable by concessionaire.
- Payments to the concessioning authority.
- Shareholding.
- General rights, duties, and obligations.
- Security of network and information systems.
- Intellectual property rights.
- Change In law.
- Force majeure.
- Events of default.
- Termination of the concession agreement.
- Transfer on expiry of transfer date.

- Dispute resolution.
- Representations and warranties.
- Miscellaneous provision.

The PCSO concession agreement should include the appendices related to the PCS project requirement: Project management and work plan, transaction fees, business plan, performance guarantees, government authorities, key personnel, list of contractors, performance standards, reporting requirements, governance framework, business continuity plan, change management plan, software quality assurance plan, transfer plan, warranty, maintenance and SLA plan, hand-over plan from implementation to operation, and a stakeholder interoperability plan.

As in any concession agreement, all sections are important to a fair balance between the concessionaire and the concessioning authority. The concessionaire should be compensated only for the financial risks, based on an objective return on investment that is agreed.

In the PPP SPV scenario one question is whether the concessioning authority should be directly or indirectly asking for voting rights and board rights. Asking the following question helps to inform the decision: does the authority have the financial capacity to invest equity in the joint venture or bring intangible assets to the table?

Finally, the transfer of the PCSO at the expiry of the concession through the transfer of shares or assets should be carefully defined in terms of the respective obligations to be performed or discharged. This will allow a smooth handover and peaceful possession of PCSO assets and shares. It ensures the concessioning authority can get organized well in advance in terms of human resources and contracting environments.

4. PCS risk management

The PCS risk management strategy described in this section has been established based on two decades of real-life experience globally, particularly in emerging and developing countries on all continents.

4.1. PCS initiation risks

Champions of a PCS project may face various challenges when initiating the PCS project, such as:

Legal framework: The most important legal and regulatory risks arise when some governmental agencies may not be willing to update their respective frameworks to enable the PCS. If a

PCS is not mandatory by regulation or law the risk of adopting the PCS by all stakeholders is quite high. Not achieving high levels of adoption makes the project failure prone. It could also reduce the efficiency of the governance structure described in the next section dealing with the business plan. Mitigation strategies include addressing the review of legal and regulatory frameworks early on. This should occur at the time of the "As Is-To Be" analysis. Driving reform is an important step forward to ensure a quick win and a sustainable environment. Preparing the required instruments early on to make the PCS mandatory is key.

Institutional framework: The most important structural risk when initiating a PCSO is the lack of collaboration between the port

and the Customs authority and between the public stakeholders and the port community.

Mitigation strategy: It is vital to address differing perceptions of the public and private sectors among both groups of stakeholders. This helps to build trust for data collaboration. Customs and ports can benefit from the upcoming guidelines from the World Customs Organization and the International Association of Ports and Harbors, where a strong focus is given to strengthening cooperation between customs and ports, the convergence of digital systems and the enhancement of supply chain security.

Public and private stakeholders: Initial risk is related to the need for business process reengineering between public and private stakeholders. This includes digitizing poorly designed manual processes. This may include removing red tape and eliminating wasteful expenditure. Sometimes there is a gap between the public and private sectors when it comes to digitalization and telecommunications. There can be big differences in terms of telecommunications infrastructure, including bandwidth, coverage, pricing, and quality of service.

Mitigation strategies: A digital transformation is required to optimize and automate business processes through business process reengineering. This means addressing the regulations associated with the strengthening and expansion of the telecommunications infrastructure. This ensures it is efficient enough to meet the needs of the PCS for safe, stable, and secure critical infrastructure.

Public sector: The public sector risks pose a significant challenge to the effective implementation and functioning of a PCS. When certain members of the public sector, particularly trade and transport regulatory and compliance agencies, are not institutionally ready to collaborate or equipped to exchange data with other community members, the efficiency and reliability of the PCS may be compromised. The lack of technical and financial expertise of key entities, such as Customs, quarantine, or standards agencies, required to exchange data through the PCS platform can hinder the seamless flow of information. This ultimately affects the smooth operations of the port community and the overall success of the platform.

Mitigation strategies: To mitigate readiness risks, it is essential for PCSOs and public stakeholders to invest in capacity building and knowledge transfer initiatives. By enhancing the technical capabilities of the stakeholders, the PCS can ensure a more efficient and secure data exchange process, thereby improving overall operations and performance. To address financial constraints, it is crucial for PCSOs and public stakeholders to explore alternative funding mechanisms, including public-private partnerships, grants, or other financial support programs from the IFI community (including the World Bank) that can help bridge the gap in resources and facilitate the integration into the PCS ecosystem.

Private sector: The role of terminal operators can also prove risky. This is applicable in countries where a terminal operator either has the monopoly or where an association of terminal operators is willing to become a PCSO. While terminal operators are key stakeholders in the maritime supply chain, they are not neutral third parties when it comes to the basic principle of data collaboration.

Mitigation strategies: The role can be played by the port authority or by the port community itself in cases where such a community is institutionalized.

Business planning: The financial sustainability of a PCS hinges on sound business planning and strategy, encompassing business models, pricing strategies, revenue generation, and resource allocation. Without sound business planning and strategy, effective business models, and well-designed pricing strategies, the PCS may struggle to maintain its viability and competitiveness in the market.

Mitigation strategies: Addressing these risks is essential. It is imperative for PCSOs to draw on expertise from international auditors in addressing business planning risks. This proactive risk management approach ultimately contributes to the success of the PCSO. It is crucial, however, to make the use of the PCS mandatory by regulation or decree. This will ensure the overall and financial effectiveness of the PCS project.

Human capital risks: High skills are required to initiate a successful PCS. Lack of resources at line ministries, in governmental agencies or among private stakeholders can create bottlenecks.

Mitigation strategies: Recruitment, talent attraction, and capacity building shall be considered fundamental aspects of any PCS project in the short to long run.

Five categories of common risks have been identified: the legal framework, institutional framework, public stakeholders, private stakeholders, and business planning. Risk mitigation measures for each risk description are also provided to assist governments and port authorities in Table 2.

4.2. PCS operational risks

PCSOs face various challenges when running the PCS, ranging from compliance with legal requirements to managing relationships with diverse stakeholders. Additionally, they must navigate technological and infrastructure complexities, protect their systems from cyber threats, and maintain operational continuity in the face of unexpected disruptions. Attracting and retaining skilled personnel, ensuring financial stability, and managing their reputation are also essential for the long-term success of a PCSO. To maintain the smooth operations of a PCSO and boost stakeholder trust, it is crucial for a PCSO to develop comprehensive risk management strategies to address these diverse challenges

Table 2. Risk Mitigation Measures for Governments and Port Authorities

#	Risk Category	Risk Description	Risk Mitigation
	Legal Framework	Inexistence of regulation or law for PCSO.	Technical Assistance with a hybrid national legal and international legal team to draft regulations or laws.
		Inexistence of digital law.	Technical Assistance with a hybrid national legal and international legal team.
		Lack of Amendment to Port and Maritime CBRAs, regulations and laws.	Technical Assistance with a national legal part of BPR.
	Institutional Framework	Lack of a strong champion.	Political will.
		Lack of inter-ministerial leadership.	Political will.
		Lack of governance.	Political will.
		Lack of engagement of public stakeholders.	Change management strategy.
		Lack of engagement of private stakeholders.	Change management strategy.
	Public Stakeholders	Business process reengineering issues at Customs & CBRAs Costs of business process reengineering.	Collaborate to Implement international best practices. Anticipate national budget planning Leverage customs IT Tax.
		Lack of digital infrastructure at CBRAS.	Anticipate by assessing digital maturity level.
		Go slow	Change management strategy.
		Lack of human, technical and financial resources dedicated to the project	Anticipate yearly budget and human resources required.
	Private Stakeholders	Lack of human, technical and financial resources dedicated to the project	Anticipate yearly budget and human resources required.
	Business planning	Lack of data and data quality for financial modelling	Collaborate with Customs.
		Informal economy	Change management strategy.
		Quality of infrastructure	Anticipate with Telcos and Power. Companies.

effectively. These risks, if not properly managed, can lead to financial losses, operational disruptions, reputational damage, and loss of trust among stakeholders.

Below, we outline the broad risk categories PCSOs face together with mitigation actions. A more structured list is provided in Table 3:

- **Legal and regulatory risks:** The PCS operates within a complex web of international and local laws and regulations, including data protection, privacy, and cybersecurity legislation. In addition, they must also comply with border, port, and maritime national laws and regulations, which are influenced by international agreements and conventions.³ Navigating this intricate legal and regulatory landscape is

essential to ensuring the smooth operation and long-term success of a PCS.

- **Mitigation strategies:** To address the legal and regulatory risks, it is crucial for PCSOs to develop robust compliance programs. These programs should encompass ongoing monitoring of regulatory changes and regular compliance audits, enabling the organization to remain up to date with the latest legal requirements and best practices. By proactively identifying and addressing potential compliance issues, PCSOs can mitigate the risk of financial penalties, litigation, and reputational damage. Given the unique characteristics and requirements of each PCS, it is essential for operators to tailor their compliance programs to the specific needs of their organization. Factors such as the nature of the data being

³ Such as the United Nations Centre for Trade Facilitation and Electronic Business (UN/CEFACT), International Maritime Organization-Facilitation of International Maritime Traffic (FAL Convention), World Customs Organization (WCO) SAFE Framework of Standards, and the World Trade Organization (WTO) Trade Facilitation Agreement (TFA) to name a few

Table 3. PCS Operational Risks Categories and Mitigation Actions

Risk Category	Risk Description	Risk Mitigation
Legal & Regulatory	Non-compliance with international regulations and legal frameworks	National legal and international legal teams to draft respective regulations or/and law.
	Inadequate data protection and privacy laws	
Institutional	Resistance to change by port community stakeholders (public stakeholders)	Change management strategy. involving stakeholders in decision-making processes
	Lack of human, technical and financial resources dedicated to the project	Anticipate yearly budget and human resources required.
	Limited Engagement of Port Community Members.	Change management strategy.
Technology & Infrastructure	Cyber threats	Plan and implement tailored cybersecurity measures
	Business Continuity	On going evaluation on risks
Human Resources	Skills gaps	Develop recruitment and talent attraction strategies and plans Train and build capacity of existing employees
	Retaining specialized employees	Adopt competitive compensation plans Improve working conditions

Source: Authors.

processed, the jurisdictions in which the PCS operates, and the potential vulnerabilities of the system should be considered when designing and implementing compliance initiatives. This customized approach ensures that the compliance program effectively addresses the unique legal and regulatory challenges faced by the PCS, ultimately contributing to a more secure and resilient operation.

- Institutional risks:** Absence of an active PCS governance structure hurts effective collaboration and communication. A well-defined governance structure outlines the roles and responsibilities of each stakeholder and establishes clear lines of communication. When functioning properly, it can provide a stable foundation for collaboration and cooperation among stakeholders. More analysis on the PCS governance structure is provided in a separate section of this paper
- Mitigation strategies:** Equally important is for PCSOs to involve stakeholders in decision-making processes in the medium to long term. This can be achieved by establishing regular channels for communication, such as meetings or structured forums, where stakeholders can provide their input and feedback on key decisions and initiatives. Also, fostering transparency and accountability are vital for maintaining stakeholder trust and addressing institutional risks. This involves openly sharing information about the operations, performance, and decision-making processes of the PCS with stakeholders, as well as holding them accountable for their actions and decisions. These actions promote a culture of openness and trust among stakeholders.
- Technology and infrastructure risks:** PCS operations depend on secure, reliable, and scalable IT infrastructure. To mitigate technology and infrastructure risks, PCSOs must maintain and upgrade existing systems but also invest in emerging technologies. Establishing partnerships with technology providers and collaborating with stakeholders to identify technological challenges can further enhance the resilience of PCS operations. Cybersecurity risks include unauthorized access, data theft, and system damage. Implementing comprehensive cybersecurity measures and incident response plans, as well as regularly training employees on cybersecurity best practices, can help to reduce these risks and maintain stakeholder confidence.
- Mitigation strategies:** Continuous monitoring of the PCS's IT infrastructure is essential to identify and address potential cybersecurity vulnerabilities. By employing effective monitoring tools and conducting regular assessments, PCSOs can detect and address issues before they escalate into larger problems. This proactive approach helps maintain the security and reliability of the system while ensuring that any necessary upgrades or changes can be implemented in a timely manner. Therefore, investing in emerging technologies and solutions and incorporating them into their systems, PCSOs can improve the efficiency, security, and adaptability of their IT infrastructure. This forward-thinking approach allows operators to be better prepared for future challenges and opportunities. PCSOs can forge partnerships with technology providers and collaborate with port community stakeholders to identify technological challenges contributing to a more resilient and secure PCS ecosystem.

Human resources risks: Attracting and retaining skilled personnel is crucial for the success of a PCSO. Human resources risks can emerge from various factors, including employee turnover, skills gaps, lack of specialized IT employees, as well as the absence of capable managers with strong communication skills and the required authority to engage high-level community stakeholders. A PCS also faces high mobility of IT employees who may seek better opportunities elsewhere. These risks negatively impact an organization's ability to operate effectively and could potentially result in operational disruptions or even financial losses.

Mitigation strategies: One of the key strategies for addressing these risks in PCS operations is the implementation of employee training and development programs which ensures that the workforce remains up to date with the latest technologies and trends. Also, succession planning is another essential aspect of addressing human resources risks, particularly in the context of management positions. The PCSO can identify potential future leaders and provide them with targeted development opportunities. Finally, by fostering a supportive work environment and corporate culture that values employee contributions and offers opportunities for growth, PCSOs can reduce the likelihood of staff attrition and maintain a skilled workforce.

4.3. Concession risk

Duration of the concession period: Another critical risk is the duration of the concession period. Since the breakeven point is dependent on a variety of potentially unpredictable factors, the duration of the concession period could pose a significant challenge for the concessionaire to achieve their return-on-investment goals.

Mitigation strategies: Annual reviews and terms of the concession may be reviewed to address the breakeven point and return on investment in a fair and transparent manner. Therefore, both

parties must be vigilant in managing this risk throughout the concession period to ensure a successful outcome for all stakeholders involved.

Transfer: Another risk for the concessioning authority that must be considered is the lack of skilled staffing to take over the operations at the end of the concession period. That could impact the efficiency of the maritime supply chain.

Mitigation strategies: Furthermore, it is important for the authorities to gradually build up the necessary skilled digital workforce over the course of the concession period to ensure a smooth transfer of assets to the concession authority at the end of the term. This process is crucial for ensuring the concessionaire can deliver on their contractual obligations and that the assets are properly maintained and handed over to the concession authority. Therefore, both parties must be vigilant in managing this risk throughout the concession period to ensure a successful outcome for all stakeholders involved.

Transaction fees: In the case of a PCSO which has been awarded a concession contract, a separate set of risks emerges. Thorough analysis of these risks goes beyond the scope of this paper. However, in our attempt to touch upon a couple of those risks, we identify extortion as a potential risk associated with outsourcing the operation of PCS via a concession contract. This can occur when the management of transactions or contracts is not aligned with the actual investment and operating expenditure or when the rates are determined solely based on the CIF value of goods.

Mitigation strategies: In practice, the concessionaire should only receive compensation for financial risks that are objectively agreed upon, such as the return on investment, as is the case with terminal operators. Therefore, it is crucial to ensure that the terms of the concession contract are well-defined and that there is proper oversight of the concessionaire's activities as described above.

5. The governance structure

Governance has a crucial role to play in implementing and operating a PCS. A governance structure is necessary for the development of PCS to ensure effective collaboration and coordination between port stakeholders involved in the development of the system, but usually working in siloes. Without a governance structure, there is a risk of fragmentation, duplication, and conflicting priorities which could lead to delays, inefficiencies, and increased costs and failure. A robust governance structure helps to mitigate significant risks associated with the implementation of such systems by establishing clear roles and responsibilities, decision-making processes, and mechanisms for resolving disputes

and conflicts. Furthermore, a well-designed governance structure for a PCS can help to ensure that the system is aligned with the strategic objectives of the port community, promotes transparency and accountability, and facilitates the sharing of benefits among stakeholders.

A governance framework is essential to provide a clear structure for decision-making, roles, and responsibilities. It also ensures that the PCS aligns with the strategic objectives of the port community. This section outlines the typical elements of a governance framework for PCS development, including the

Table 4. PCS Concession Risk and Mitigation Measures

Risk Description	Risk Mitigation
Resistance to change	Governance and institutional framework. Change management as key driver of business process re-engineering.
Risk of underperformance	Driven by deliverables. SLA and KPIs into the concession agreement. Non-performance penalties.
Financial sustainability over the concession period	Detailed financial business plan. Sustainability as part of the concession agreement. Legal framework to regulate operations.
Loss of control of core activities	Concession agreement based upon best practice. Conduct due diligence of preferred bidder before award.
Loss of control of critical infrastructure	Critical national infrastructure for national security. Technical assistance in drafting national policy on Critical national infrastructure and their resilience.
Data Security & Storage	PCS operator as trusted third party. Data storage to be hosted by Government. Legal framework for data governance.

Source: Authors

Inter-ministerial Committee, Steering Committee, Business Process Committee, and Working Groups. It describes their roles and responsibilities and how they contribute to the success of the PCS project. A schematic representation of the governance structure is offered in Figure 6.

Therefore, a typical governance framework is comprised of the following four elements:

- Inter-Ministerial Committee:** The Inter-Ministerial Committee is a high-level committee that comprises representatives from relevant ministries. Its role is to provide strategic direction, oversight, and coordination for the development and implementation of the PCS. The committee is responsible for approving the overall PCS vision, policy, and legal framework, as well as providing guidance on funding, prioritization, and monitoring of the project.

The range of multisectoral, multidisciplinary responsibilities encompassed in an initiative of this type requires the establishment of an appropriate cabinet-level board forum, chaired by the prime minister or president's office in supporting the champions of the PCS project and in avoiding competing interests between line ministries and governmental agencies. The committee will focus on the strategic coordination and the legal, regulatory, and policy issues. Appendix 1 outlines recommended participants and the responsibilities of the Inter-Ministerial committee as well as frequency of the committees. More details about the responsibilities of the Inter-Ministerial committee can be found in Annex 4

- Steering Committee:** The Steering Committee is an executive-level committee responsible for guiding and supervising the PCS project. Its role is to ensure that the project is progressing according to plan, and it has the authority to make decisions on project direction, scope, and budget. The committee comprises representatives from Customs, the port authority, terminal operators, shipping lines, and other stakeholders. It is responsible for reviewing and approving project plans, monitoring project progress, and ensuring that the project is aligned with the overall PCS vision and strategy.

The Steering Committee should comprise the director generals of the public agencies and the presidents and secretary generals of private stakeholder organizations and associations. The role of the committee is to lead the implementation of the PCS and play an instrumental part in the long-term sustainability of the PCSO. All key stakeholders must be included in the committee, and each must have an equal voice. In strategic leadership roles, the committee chair and vice chairs will work to empower collaboration while leading the project and demonstrating their neutrality. The core public partners invited to the committee should include the port authority, maritime authority, Customs authority, and foreign trade authority.

When a national Port Community Council (PCC) exists, the steering committee could be implemented within the context of a PCC. When there is a national Maritime Transportation Facilitation Committee, per FAL Convention recommendation, the steering committee could as well be implemented within the NMTFC. When a National Trade Facilitation Committee

Figure 6. Typical PCS Governance Framework



Source: Authors.

exists, the steering committee could also be implemented within the NTFC. The strategic objective of steering will be to close the gaps and to establish trust between cross-border regulatory agencies and between CRBAs and private stakeholders, to facilitate trade and secure the supply chain.

The steering committee could be chaired by the port authority and or co-chaired (or vice-chaired) by the Customs authority. The chair will need to demonstrate the joint leadership on trade facilitation and supply chain security of the two authorities, and their neutrality towards the public and private stakeholders. Table 6 outlines the proposed composition, scope of responsibility, and suggested frequency of meeting of the steering committee.

- Business Process Committee:** The Business Process Committee is responsible for developing and reviewing the business processes and procedures that underpin the PCS. Its role is to ensure that the PCS is designed to streamline and optimize port operations, and it aligns with industry best practices. The committee comprises representatives from port stakeholders, such as Customs, shipping agents, freight forwarders, and terminal operators. Its responsibilities include identifying process improvements, developing and implementing new processes, and ensuring that the processes are integrated into the PCS. This committee should comprise representatives of all public agencies and private stakeholder organizations involved in the project. Each public agency and private stakeholder organization should nominate at least two people who are recognized as a business process expert in their own organizations. The committee will participate in business process analysis, optimization, automation, and reengineering. The committee will have a key role in the long term for the ongoing evolution and sustainability of digital business processes.

- Working Groups:** Working Groups are responsible for developing specific elements of the PCS, such as business processes per stakeholder type, interoperability and cybersecurity protocols. The working groups comprise subject matter experts from all stakeholder groups. Their responsibilities include developing technical specifications, testing, and validating PCS components, and ensuring interoperability with other systems. Working groups provide technical input to the Business Process Committee and Steering Committee and play a critical role in ensuring the success of the PCS project.

More details about the responsibilities of the Business Process Committee and Steering Committee can be found in Appendix 1, 2 and Appendix 5 and Appendix 5. It is important to note that the governance structure presented in this paper may look different on the ground. This will depend on the economic and business environment of the country and the structure and operational specificities of the port. Design also differs slightly between a developed country and an emerging or developing country. However, variations of these structures are found in most of the ports around the world which have already adopted a PCS or are doing so. The guiding principles of the generic governance structure should be applied as global best practice.

Value-added in the design and implementation phases. The governance structure described above contributes to the implementation of the PCS as a public and private data collaboration platform.

It requires: (i) Stakeholders' engagement. (ii) Data governance establishment. (iii) Data orchestrating. (iv) Change management. (v) Long-term financial sustainability.

This governance is needed during both the design and implementation phases.

Box 3. The pivotal role of Port Community Councils in enhancing port operations and digitalization

While designing and implementing a Port Community System relies on well-established technical standards, as a practical matter its ultimate success depends in good part on securing the buy-in of the local port and shipping community at large. An effective way to achieve this is to mobilize the community using the Port Community Council as its official representative body.

As part of its generic mandate, the port community council has a critical role to play in improving the transparency of port operations, for the benefit of all users and final customers of port services, including shippers. In this regard it represents an adequate platform to bring forward new projects of mutual interest to private actors and public administrations, and to reach consensus on their design and implementation methods. It must be a formal instance, with an explicit mandate and working arrangements. It will hold regular meetings, typically on a monthly basis, and barring any special circumstances, its deliberations will be made public.

Most existing port community councils are consultative entities, which are obviously valuable as a conduit between port authorities and their professional environment, but this status could be enhanced by making them an official channel to table questions from port customers about, for instance, the implementation of a new Port Community System. To make it an effective process this channel must be part of a customer feedback loop defined as such in the port

Institutional and contractual arrangements.

In the case of Mauritius, the Port Users Council set up by the Mauritius Ports Authority as part of the port sector modernization program in the late 90's had, among other duties, to advise on port regulations, procedures and practices, documentation systems and other related matters. In this context it was later instrumental in helping implement the new Port Community System, the Mauritius Cargo Community System Ltd (MACCS). The MACCS is a public-private partnership that has been appointed by the Government of the Republic of Mauritius to build and manage the Cargo Community System. MACCS operates an information system ensuring the data collection and the processing of information in relation to the import and export of goods, as provided and received by the professional interacting in the cargo and/or the air cargo sectors.

On a more recent occasion, the new Port Sector Law being drafted for Lebanon, in the wake of the blast that devastated the port of Beirut in August 2020, includes specific provisions to set up formal port communities to be represented by a dedicated Port Community Council in each port of national importance. This appears all the more important in this specific case that until now the overall legal and governance framework of the sector was only very loosely defined, with no voice officially given to all private economic actors and customers. As the draft law also establishes the legal basis for a broad digitalization agenda, including comprehensive PCS, one can expect that the establishment of the Port Community Councils will facilitate the development and progressive implementation of the local PCS, which should prove to be, in this particular instance, a genuine exercise in transparency as well as in improvement of operational efficiency for the benefit of all port users and customers.

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During the **initiation phase** it provides a framework for collaboration and coordination among the various parties. The Steering Committee and Business Process Committee play critical roles in defining the scope of the project, setting strategic objectives, and ensuring that the PCS meets the needs of all stakeholders. The working groups also contribute to the **design phase** by providing technical guidance and recommendations on specific aspects of the system, such as data standards and interoperability.

During the **implementation phase**, the governance structure helps to ensure that the PCS is implemented in a coordinated and effective manner. The Steering Committee oversees the implementation process, ensuring that the project progresses according to plan and that any issues or risks are addressed in a timely manner. The Business Process Committee helps to ensure that the PCS is aligned with the business needs of all stakeholders, and the working groups contribute by providing technical support and guidance.

The governance framework during the operational and maintenance phase helps support day-to-day operations. Once the PCS is developed and implemented, it enters the operational phase, where it is used to support the day-to-day operations of the port community. During this phase, the governance structure helps to ensure that the PCS continues to meet the needs of all stakeholders and that it operates efficiently and effectively. The Inter-Ministerial Committee continues to provide oversight and ensure that the PCS complies with applicable regulations and policies. The Steering Committee remains responsible for setting strategic objectives, overseeing project progress, and resolving any issues that may arise during the operation and maintenance phase. The Business Process Committee continues to ensure that the business processes are integrated into the PCS over the roadmap and that they remain aligned with the needs of stakeholders. The Working Groups focus on maintaining the functional and technical aspects of the system and implementing any necessary improvements and releases.

The complementary nature of the PCS governance framework and Port Community Council (PCC). The governance framework

and the PCC are related, but they serve different purposes. The governance framework is responsible for providing guidance and oversight for the development and implementation of the PCS. On the other hand, the PCC is a broader stakeholder platform that brings together all the key stakeholders involved in the port community, and serves as a forum for collaboration, coordination, and information sharing. Its main objective is to promote the efficient and effective functioning of the port community. However, as mentioned above, in some cases, the PCC may undertake the role of the Steering Committee or complement its activities.

The role of board of directors of the PCSO.: The board of PCSO will act as the operational layer of the PCS governance framework. The structure of the board will reflect that of the PCSO, whether public, private, or public-private partnership. The role of the board is to set the strategy and oversee the management. In some cases, such as in the Netherlands, the PCSO may establish a strategic advisory board to reflect the strategic landscape of the national port and maritime community.



6. Conclusion

This chapter delves into a comprehensive analysis of the governance structures and operational models of a PCS. We investigate the management and administrative facets of models used in various ports around the globe. Additionally, we outline the responsibilities of PCSPs in overseeing the IT infrastructure, creating new services and applications, and guaranteeing the overall efficacy of the system. This section scrutinizes the diverse models of PCSPs, encompassing private, public, and hybrid models, and examines the pros and cons associated with each model. Furthermore, it considers the common risks encountered by PCSOs, such as technical, legal, regulatory, financial, and reputational risks, as well as the tactics operators could employ to alleviate these risks.

Based on this analysis, we summarize below the key takeaways of this chapter.

1. A PCSO manages and maintains the PCS, promoting public-private data collaboration within a local or nationwide seaport ecosystem. It ensures seamless information exchange, legal and regulatory compliance, and the adoption of emerging technologies by closely collaborating with port stakeholders.
2. The role of public executives from port and Customs authorities with strong leadership, and their capacity to engage and to collaborate with public and private stakeholders for the common good of the port community is essential from the inception to implementation of the PCSO.
3. Champions are essential to the inception of the PCS project. This includes the CEO of the port authority and the Commissioner of the Customs administration. It can also include the President of the Port Community Association, who seek to streamline their operations and reduce costs. Regardless of who initiates the PCS, it may be operated by a range of entities, including the port authority or a third-party operator with expertise in PCS management.
4. The financial sustainability of operators ensures the long-term success of a PCS. Even though many governments include PCS development and maintenance costs into the port authority's budget and others seek private capital, there is still room for the involvement IFIs. Their financial assistance could be coupled with upstream technical assistance to improve the enabling environment. They can help define functional specifications and technical specifications and advise during the procurement process.
5. Operators of a PCS face several risks that can adversely affect their performance from initiation to operations stages. Effective risk management strategies and a port community centric approach can help them mitigate these risks and improve their performance. Tools they have at their disposal include the adoption of robust risk management strategies which encompass political will, business planning, change management, compliance monitoring and critical information infrastructure.
6. A governance structure is necessary for the initiation and the implementation of a PCSO. This ensures effective collaboration and coordination between port stakeholders involved in the development of the system. Without a governance structure, there is a risk of fragmentation, duplication, and conflicting priorities which could lead to delays, inefficiencies, increased cost, and failure.
7. It is evident from successful PCS implementations that there are benefits of robust operating and governance models. PCS initiators, however, often face a challenge in choosing the most appropriate operator model (public, private, or public-private partnership) for their unique needs. Their primary responsibility, therefore, is to make informed decisions and fully leverage the advantages of PCS. .

Appendix 1. Responsibilities of a representative Inter-Ministerial Committee

Inter-Ministerial Committee	
Participants	<ul style="list-style-type: none"> • Ministry of Transport • Ministry of Finance • Ministry of State-Owned Enterprises • Ministry of Foreign Trade • Ministry of Immigration • Ministry of Health • Ministry of Environment • Ministry of Agriculture • Ministry of National Security • Ministry of Defense • Ministry of Digital Economy
Chair	<ul style="list-style-type: none"> • Prime Minister or President's Office • Vice-chair by lead line Minister(s)
Responsibilities	<ul style="list-style-type: none"> • Facilitate PCS project • Facilitate stakeholder cooperation • Drive policy reform and policy making • Review laws and regulations • Drive public-private data collaboration • Supervise PCS implementation • Improve supply chain security • Improve safety • Drive sustainability • Drive innovation • Drive human capital and capacity building • Promote emerging technologies
Frequency	<ul style="list-style-type: none"> • Quarterly

Appendix 2. Responsibilities of representative Steering & Business Process Committees

	Steering Committee	Business Process Committee
Participants	<ul style="list-style-type: none"> • National Port Authority • Maritime Authority • Customs Authority • Ministry of Foreign Trade • Ministry of Immigration • Ministry of Health • Ministry of Environment • Ministry of Agriculture • Ministry of Digital Economy • Ministry of National Security • Terminal Operators Association 	<ul style="list-style-type: none"> • Shipping Lines Association • Airlines Association • National Logistics Association • Freight Forwarder Association • Clearing Agents Association • Truckers Association • Rail Operators Association • Importers Association • Exporters Association • Insurance Association • Banking Association • Chamber of Commerce
Chair	<ul style="list-style-type: none"> • Port Authority 	
Co-Chair	<ul style="list-style-type: none"> • Customs & Maritime Authority 	
Responsibilities	<ul style="list-style-type: none"> • Review project status report • Follow up on milestones • Follow up on deliverables • Follow up on action items • Follow up on issues • Discuss outstanding problems • Discuss proposed actions to be taken • Take corrective actions • Resolve deviations from schedule • Evaluate impact on safety, security, and sustainability • Assess risk management • Assess change management • Review the legal framework 	<ul style="list-style-type: none"> • Review project status report • Follow up on milestones • Follow up on deliverables • Review as-is business process • Review to-be business process • Digitize all manual processes • Digitize all processes within international trade community • Redesign all business processes as needed • Foster best practices • Introduce and review new business procedures • Implement standardization • Focus on safety, security, and sustainability • Imagine use cases for emerging technologies • Foster best practices • Support in-change management activities related to implementation or introduction of new and redesign processes
Frequency	<ul style="list-style-type: none"> • Monthly 	<ul style="list-style-type: none"> • Monthly and on demand for working groups

