Reforming and Rebuilding Lebanon's Port Sector Part II

POLICIES AND SOLUTIONS FOR DIGITALIZING THE PORT OF BEIRUT

JUNE 2021

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Disclaimer

Although the Authors have made every effort to engage with a wide spectrum of stakeholders and involve highly qualified, relevant peer reviewers, this Paper remains a living document to be updated as and when additional information is made available. It provides an overview of global experiences and offers a set of guiding principles to help inform port sector reforms in Lebanon and pave the way to rebuild a better Port of Beirut.

Acronyms

3RF	Reform, Recovery, And Reconstruction Framework
AI	Artificial Intelligence
ASYCUDA	Automated System for Customs Data
DB	Doing Business
DGMS	Dangerous Goods Management System
EDI	Electronic Data Interchange
EDIFACT	Electronic Data Interchange for Administration, Commerce and Transport
ENISA	European Union Agency for Cybersecurity
EU	European Union
FAL	Facilitation of International Maritime Traffic
IAPH	International Association of Ports and Harbors
IMO	International Maritime Organization
IPCSA	International Port Community Systems Association
ISPS	International Ship and Port Security
IOT	Internet of Things
ISO	International Organization for Standardization
KPI	Key Performance Indicator
LPI	Logistics Performance Index
MENA	Middle East and North Africa
MSW	Maritime Single Window
NSW	National Single Window
OECD	Organisation for Economic Co-Operation and Development
PCS	Port Community System
PoB	Port of Beirut
PPP	Public Private Partnership
RDNA	Rapid Damage and Needs Assessment
RKC	Revised Kyoto Convention
SOLAS	International Convention for The Safety of Life At Sea
SPS	Sanitary-Phyto Sanitary
TAB	Trade Across Borders
TFA	Trade Facilitation Agreement
TRS	Time Release Studies
UNCTAD	United Nations Conference on Trade and Development
UNECE	United Nations Economic Commission for Europe
UN/CEFACT	United Nations Centre for Trade Facilitation and Electronic Business
WCO	World Customs Organization
VTMIS	Vessel Traffic Management Information system
WTO	World Trade Organization

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Executive Summary

The resilience of the Lebanese port sector has proven to be low. The impact of the ongoing economic crisis, the COVID-19 pandemic, and the Port of Beirut (PoB) explosion has traumatized the sector and exposed its weaknesses and inabilities to predict, identify, and respond to external risks. Anticipated slow recovery is expected to intensify the burden on the economy while opportunity costs are high given the recent port developments in the Eastern Mediterranean region and globally.

Digitalization is one of key foundational stones for reconstruction. The "Reforming and Rebuilding Lebanon's Port Sector " note that the World Bank published in January 2020 highlights that there is a unique opportunity for rebuilding better the PoB and recommends a roadmap around four key building blocks: i) a new governance structure based on the landlord port model; ii) efficient and modern trade compliance procedures; iii) open and transparent bidding processes for selecting investors, operators, or concessionaires; and iv) quality infrastructure contingent on a national port strategy and a revised PoB masterplan.

Port digitalization will generate positive spillover effects. Digitization will be beneficial for the Lebanese trade and economy as a whole as it will assist the port to:

a. **Combat corrupted practices.** Port automation enables remote trade transactions and prevents physical contact between public and private stakeholders, which could lead to unlawful practices. Digitalization can reduce the perception of the port being the embodiment of widespread corruption and increase trust in government officials.

b. **Reduce trade costs and bureaucracy.** The cost of trade documentary compliance is higher in Lebanon compared to countries using advanced digital systems. Process digitalization and adoption of a paperless environment leads to reductions in transaction costs and enables more small and medium enterprises to participate in international trade.

c. **Upgrade safety and security.** Port digitalization and automated systems make movements of hazardous substances more transparent and permit identification of dangerous levels or cases of combined storage. Such systems also make it possible to check and verify compliance with the required marking and approved storage quantities.

d. **Reach high levels of service efficiency.** Digitalization improves the efficiency and effectiveness of logistics services as the single electronic submission of trade and transport data allows stakeholder co-ordination toward expedited cargo inspection and release.

e. **Increase supply chain predictability.** Availability of transparent data and information about the vessel arrival time and cargo clearance improves port planning and resource allocation. In addition, it improves cross-organizational coordination of activities, which leads to the reduction of supply chain risks and improves inventory management and control.

f. **Improve regulatory oversight and policy decision making.** The adoption of specialized digital platforms enables ports' management to generate a vast amount of new data which, once mined, generates new business intelligence and insights about cargo flows throughout the trade and transport continuum.

Digitalization will also allow optimization of the port masterplan. Along with the obvious need for port reconstruction, Lebanese policymakers have a rare opportunity to redesign it around essential cargo flows and optimize the sizing and location of infrastructure and superstructure investments. Process streamlining and re-engineering, which is a pre-requisite for proper digitalization, will eliminate the risk of digitalizing duplicate and inefficient workflows. The new masterplan should be designed in a way to take into consideration the digital and the physical dimension of investments.

The proposed PoB digitization action plan comprises three pillars. These pillars ensure that policy considerations go beyond the technological architecture and include economic framework and human capacity dimensions:

a. **The institutional pillar** aims at strengthening the Lebanese digital enabling environment and entails reforms in the legislative, institutional, and operational framework toward trade facilitation, improved border compliance, and adequate national digital infrastructure.

b. **The digital pillar** recommends the implementation of three port digital solutions: (a) Maritime Single Window (MSW) as single entry point of information for ship-to-shore data exchange, in compliance with the IMO FAL Convention; (b) a Port Community System (PCS), enabling intelligent and secure information exchange between public and private stakeholders, with the first stage being its adoption at the PoB; and (c) a National Single Window (NSW), enabling data collaboration between trade and border compliance agencies.

c. **The human capital pillar** ensures that the required capacity is in place both from the public and the private sector. Low public sector capacity constitutes a major issue especially in terms of digital infrastructure development under a PPP scheme, while the Lebanese private sector should present the necessary technical ICT and operational skills to adjust to the new era of digital port logistics.

Political consensus and support is a firm requirement. The implementation of the PoB digital action plan requires a high level of political commitment. In politically fragile environments, such as in Lebanon, securing the support of all political parties, and building a strong consensus among all stakeholders, is a firm prerequisite. The adoption of the digital agenda by the office of the Prime Minister, once appointed, would be a sign of firm political pledge. This approach will also unlock long overdue Customs institutional and legislative reforms which hinder Lebanese ports operational efficiency and increase the cost of international trade

The port community must be empowered. Successful design, customization, and implementation of digital solutions require frequent and structured consultation with port public and private stakeholders. A bottom-up approach is necessary to record and understand port-sector challenges, define the level of interaction between private sector and compliance agencies, and promote digital solutions for the benefit of the entire community. Most importantly, a broadly accepted digital port strategy should be adopted to define the national vision for the development of Lebanese smart ports of the future, based on sustainable public-private data collaboration.

Finally, the funding of port digital solutions should be incorporated into the bigger financing package for the PoB reconstruction. A dire macroeconomic outlook and continuing economic crisis prevents Lebanon from selecting publicly financed digital solutions. A wide range of public and private options could be examined. The PoB digital infrastructure may be implemented and operated either by (i) a Public Operator from a governmental agency or state-owned company, fully operated in house or subcontracted to a private firm under a management contract, (ii) a Public/Private Operator, with joint equity share, and Private Operator acting under a concession agreement, or (iii) a Private Operator acting under concession agreement.

Introduction

The Context

1. **On August 4, 2020, a massive explosion severely damaged the PoB.** The blast devastated the city, killing at least 200 people, wounding thousands, and displacing around 300,000. The explosion caused between US$3.8 and US$4.6 billion in damage to physical assets, with damages to the PoB amounting to around US$350 million. The blast also resulted in losses, including changes in economic flows, estimated to be in the range of US$2.9 to US$3.5 billion.[1] The cause of the explosion has raised legitimate questions about the ability of the port to control cargoes being stored at its facilities and to monitor and mitigate risks related to the existence of dangerous goods at its premises. Based on the findings of the RDNA, a Reform, Recovery, and Reconstruction Framework (3RF)[2] was developed by the World Bank, the UN, and the EU to guide the "building back of a better Lebanon" based on principles of transparency, inclusion, and accountability. In addition, the World Bank published the "Reforming and Rebuilding Lebanon's Port Sector: Lessons from Global Best Practices" paper,[3] which encapsulates the core principles under which the new PoB should be governed and operated.

Figure 1. Building blocks for the reconstruction of the PoB
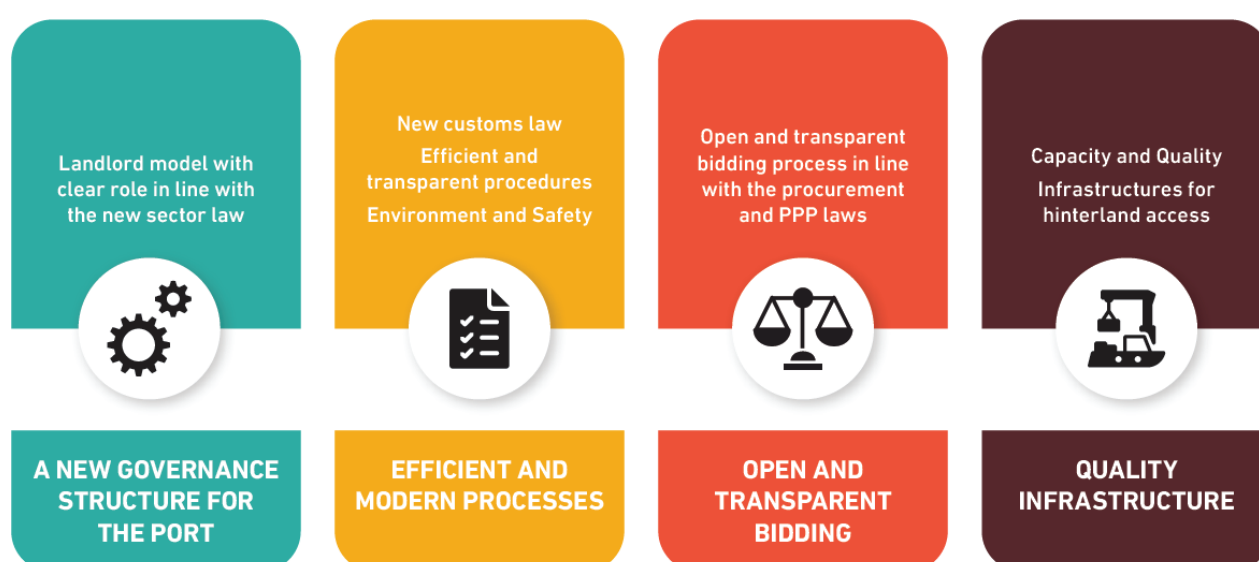
Source: Reforming and Rebuilding Lebanon's Port Sector: Lessons from Global Best Practices (English). Washington, D.C.: World Bank Group.

2. **Ensuring efficient and modern processes and procedures is one of the guiding principles for the port reconstruction.** The need for the development of a comprehensive agenda by the Lebanese government toward port procedural improvement through digitalization is one of the key messages communicated in this paper and also supported by the donor community. The existence of efficient and modern trade and transport processes is a prerequisite for building a better, more efficient, and transparent port, as shown in Figure 1. Along with the adoption of a new governance structure (based on the landlord port model), the design of open and transparent bidding processes, and the masterplan's revision toward the development of quality infrastructure, these constitute the four building blocks for the reform and reconstruction of the PoB. Efficient and modern port processes imply the undertaking of targeted simplification, harmonization, and standardization actions through the use of information and communication technology (ICT) to enhance the port's capability to coordinate intra-port trade and transport operations.

3. **The new port should be built considering trade processes automation and digitalization.** Infrastructure investments should be coupled with the parallel implementation of port and border management reforms. These include, but are not limited to, the upgrade of the legislative framework of the Port Authority and the Customs Administration,

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1   Beirut Rapid Damage and Needs Assessment, August 2020, World Bank Group.

2   *https://www.worldbank.org/en/country/lebanon/publication/lebanon-reform-recovery-reconstruction-framework-3rfAEO*

3   "World Bank. 2020. Reforming and Rebuilding Lebanon's Port Sector: Lessons from Global Best Practices. World Bank, Washington, D.C. © World Bank. *https://openknowledge.worldbank.org/handle/10986/34989 License: CC BY 3.0 IGO.*"

which will provide the legal basis for port stakeholders to coordinate at both strategic and operational levels. High levels of stakeholder coordination should be reflected in the adoption of re-engineered processes and procedures for harmonization and simplification. Changes should be examined in a cross-sectoral (holistic) manner, allowing the government to achieve long-term efficiency and transparency. In the absence of an orchestrated reform approach, current overlapping regulatory requirements, repetitive cargo inspections, and submissions of redundant documentation will continue to be the excruciating daily reality of the trading community. The performance of the future Beirut port will be inadequate unless digitalization is embedded into port operations and used as a vital mechanism to simplify complex processes and procedures.

4. **The adoption of digital solutions has profound positive effects both on demand and supply side.** International experience has proven that the adoption of electronic data exchange in the import and export process reduces trade costs. Modern port digital systems include -among others- an integrated approach with a '" whole of government" vision to the development of a port community system, a maritime single window and national single window, running under appropriate cybersecurity and interoperability standards. Process digitalization is expected to improve ports' efficiency and effectiveness. This will, in turn, reduce current high trade transaction costs, improve supply chain competitiveness, and allow export-oriented small and medium enterprises to reinvest in the production process. On the supply side, digitalization leads to profound operational efficiencies for terminal operators and logistics service providers operating at and around the port, and also leads to the streamlining, simplification, and standardization of the operating procedures of border agencies as well as other transport and trade compliance entities.

5. **Port logistics digitalization in Lebanon has been limited and uncoordinated.** Several automated systems currently exist, yet they differ in terms of technological sophistication and interoperability capabilities. A variety of port, maritime, and border management automated systems have been introduced at different times and implemented in silos by separate ministries as well as by private stakeholders, such as shipping lines and terminal operators. This has led to an IT ecosystem characterized by lack of interoperability, limited public-private collaboration, and absence of a holistic vision embracing both trade and transport logistics dimensions. As a result, past efforts to develop integrated platforms had less than expected impact on port efficiency and on the improvement of the business environment for the industry. In this context, improvements from a legislative but also a technical point of view to favor interoperable data exchange platforms between administrations would be desirable.

6. **This paper focuses on the trade digitalization dimension of the Lebanese port reform agenda.** It follows the principles of the recent World Bank publication on digitalization of maritime supply chains, which underlines digitalization as not solely a technological issue, but also as human capital and institutional issues.[4] It describes, inter alia, how improvements in border management, inter-agency collaboration, coordination between the trade logistics industry and public regulatory and compliance agencies, and the adoption of digital solutions can improve trade and facilitate intra-port cargo flows in a secure, efficient, and transparent manner.

Objectives

7. **This paper outlines key principles for the design and implementation of digital trade solutions at the PoB.** It explains the need for digitalization based on our knowledge of existing automated solutions, outlines the building blocks of the required enabling environment, and presents the chronic obstacles to change. By comparing the Lebanese digital infrastructure, legal, or regulatory capabilities with those observed in other countries around the world, this paper offers a consequent action plan tailored to the Lebanese economic and political context. The World Bank and the rest of the donor community can play an important role to implement presented options through its financing, technical assistance, and knowledge sharing offerings and capabilities.

8. **The target audience of this paper is Lebanese port stakeholders.** The objective is to provide a quick assessment of the current situation and to inspire political leaders and the private sector to envision, design, prioritize, and - most importantly - achieve the practical implementation of digital reforms. In this context, it purposely attempts to present complex and deep technical issues in simple language, hoping that they will be understood and accepted by the largest audience possible. The target audience goes beyond government officials and public sector decision-makers to include key private sector players currently operating at the port and with vested interest in modernizing port logistics services.

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4   Humphreys, Richard Martin; Biju, Ninan Oommen; Tan, Hua; Zhu, Tong; Sargent, Sandra; Verhoeven, Patrick; Ollivier, Pascal. 2020. Accelerating Digitalization: Critical Actions to Strengthen the Resilience of the Maritime Supply Chain. Washington, D.C.: World Bank Group. *https://imagebank2.worldbank.org/search/32775900*

9. **This paper does not aim at the complete and comprehensive outline of global port digital solutions.** Data collaboration platforms and information technology solutions are rapidly evolving and enhanced by advancements in big data management, artificial intelligence, and the Internet of Things (IoT). Mindful of Lebanon's inefficiencies and the nature of identified gaps, this paper carefully selects a number of must-have solutions, leading to direct operational improvements, while keeping its distance from more sophisticated solutions that could be implemented in the future. Therefore, the focus is placed on the development of three interoperable systems and the improvement of the enabling environment which will allow maximum developmental impact. The paper also touches on important cross-cutting themes -such as cybersecurity and interoperability standards- which constitute vital prerequisites for successful implementation. In this context, the quantification of trade and transport benefits as a result of port digitalization policies and reforms is outside the scope of this paper.

10. **The proposed action plan focuses on local digital solutions with sectoral application.** Recommendations are customized -to the extent possible- to the specific requirements of the PoB and its priorities following the 2020 blast and the necessity to adapt to the COVID-19 era. However, these key implementation principles can be utilized for the transformation of the entire Lebanese port sector. In addition, some of the changes recommended, such as the ones related to Customs and regulatory border agencies or ICT infrastructure, constitute structural economic reforms with national coverage and applicability and, therefore, affect not only the national port sector but also the entire Lebanese economy.

The Outline of the Paper

11. **This paper summarizes good practices in port digitalization solutions and offers recommendations for implementation in the PoB.** The first section describes the status quo of the PoB and takes stock of existing IT platforms, enabling environment, and reform impediments. The second part answers the fundamental question on the need to digitalize, presents most used port and maritime digital solutions, and summarizes critical factors of success, based on global implementation experience. The final section recommends a digitalization action plan for the PoB, and briefly describes assistance modalities that could be mobilized from the donor community for its implementation.

1. The Port of Beirut

1.1   The Port in the Post-Explosion Era

A. PORT RESILIENCE AND REFORM OPPORTUNITIES

12. **Lebanon has been suffering from three mega-crises: an economic and financial crisis, the COVID-19 pandemic, and the aftermath of the PoB explosion.** Each one of the crises had a unique impact on the country's ability to maintain the integrity of the national supply chains. While the financial crisis had an indirect impact on trade activity, driven by shortage of foreign currency and the inability of the banking system to finance trade transactions, the effect of COVID-19 and the port explosion has been more apparent, as they have changed the way trade flows and international supply chains are channeled through major Lebanese seaports including the PoB.

13. **Lebanon's financial crisis made the first hit on the country's trade sector.** The crisis, started in 2019, was created by a sudden stop in capital inflows which precipitated systemic failures across the banking and debt sectors. Exchange market pressures stifle trade and corporate finance in the highly dollarized economy, constraining the importation of capital and final goods, and inducing disruptions all along the supply chain. The sharp economic contraction implied a commensurate drop in imports, and consequently, an anticipated narrowing of the current account deficit. According to the World Bank,[5] during the first eight months of 2020, merchandise imports shrank by 50 percent, which drove a 59 percent decrease in the trade-in-goods deficit.

14. **The COVID-19 pandemic response, through lockdown, created major disruptions to Lebanon's international trade flows.** One of the key lessons learned early in the pandemic was the need to ensure business continuity of the critical supply and logistical chains via port trade gateways. In March 2020, the Lebanese government imposed a general lockdown to counter COVID-19 that included closure of the borders and of public and private institutions. Impediments to the maritime logistical chains resulted in tangible repercussions for the Lebanese port logistics business ecosystem. The country lacked the necessary policies, strategies, and operational plans to address or at least to minimize the negative consequences to port logistics operations.

15. **The PoB explosion created the ultimate shock to the national trade logistics system.** The massive blast devastated the city, killed at least 200 people, wounded thousands, and displaced around 300,000. According to a Rapid Damage and Needs Assessment (RDNA),[6] the explosion caused between US$3.8 and US$4.6 billion in damage to physical assets, with damages to the port itself amounting to around US$350 million. The blast also resulted in losses, including changes in economic flows, estimated to be between US$2.9 and US$3.5 billion. The accident raised questions about the port's ability to monitor and control its operations and the level of coordination among port stakeholders and underlined the need to modernize the structure and digitalize the operations of the national port logistics industry.

16. **These crises generated the urgent need to improve port resilience to unforeseen events.** The post-explosion era demonstrates the critical role of the PoB as a pillar of economic development and growth. It also reveals the paramount importance of proactive policy making in support of critical port infrastructure. The PoB should be considered as a critical asset whose facilities, systems, and networks, whether physical or digital, are vital to Lebanon. Their incapacitation and destruction have a debilitating effect not only on economic security, safety, and public health, but also on the ability of Lebanese importers and exporters to participate in the global trade system, a fact with negative consequences for the national economy.

17. **A new approach to reflect on port reconstruction emerges.** This is a unique opportunity for the reconstruction of an efficient and modern port. This requires that, along with the apparent need for infrastructure investments, attention has to be paid on the re-design of simplified, standardized, and digitalized processes and procedures. The new paradigm should be founded on the apparent need to offer efficient services to port users, customers, and beneficiaries, and allow them to reap the benefits of cost and time reduction and service quality improvements. Process digitalization contributes to all the above, as analyzed in the following section, but requires more than a mere installation of hardware and software solutions. It should be supported by relevant legislation and reinforced by the adoption of port governance and border management reforms. In fact, structural reforms and port digitalization plans should precede the physical reconstruction and should be embedded in the port design phase.

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5   Harake, Wissam; Jamali, Ibrahim; Abou Hamde, Naji. 2020. Lebanon Economic Monitor: The Deliberate Depression (English). Washington, D.C.: World Bank Group.

6   In the immediate aftermath of the blast, the World Bank, in cooperation with the United Nations (UN), the European Union (EU), and other partners, launched a Rapid Damage and Needs Assessment (RDNA).

B. BENEFITS FROM DIGITALIZATION

18. **Increase trade competitiveness.** Around 80 percent of global trade by volume and more than 70 percent of global trade by value are carried by sea and handled by ports worldwide.[7] The global trade industry has realized that by introducing advanced technology, operations become more efficient and cost-effective. The World Bank Logistics Performance Index (LPI), Doing Business (DB) indicators on trading across borders, and the World Economic Forum's Global Competitiveness Index (GCI) on efficiency of seaport services and border clearance, indicate the extent to which inefficiencies at a nation's sea borders can impact international trade competitiveness. Digitization is beneficial for trade, especially in terms of clearance times, transparency, elimination of paper documents, improved analytics, and operational simplification. Its decree of success depends on the type of digital solution and the depth of its adoption. As seen in Table 1, Lebanon lags behind competing countries in the region when it comes to the cost and time of trade. The PoB should maintain and improve its position in terms of technological innovation and integration, both to ensure high levels of operational efficiency but also to promote transparency, predictability, and accountability in trade-related transactions. Early assessments of tangible benefits, and the economic impact from the adoption of single windows structures, are very encouraging (see Box 1). A comprehensive list of benefits per stakeholder is found in Annex 1. Some of the core benefits of port digitalization are outlined below.

Table 1. Lebanon's Performance on the Doing Business Trading Across Borders (TAB) Indicator[8]

Country	TAB rank	TAB score	Time to export (hours)	Cost to export (US$)	Time to import (hours)	Cost to import (US$)
OECD high income	26	94	15	170	12	122
MENA Region	117	62	119	683	167	775
Greece	34	94	25	330	2	0
Cyprus	50	88	20	350	17	385
Jordan	75	79	59	231	134	396
Saudi Arabia	86	76	48	392	104	731
Tunisia	90	75	15	575	107	740
Libya	129	65	144	625	175	697
Lebanon	153	58	144	580	252	925

19. **Combat corrupted practices at the port.** Lebanon is ranked 149th out of 180 countries measured in the Transparency International Corruption Perceptions Index (TI-CPI) and one of the most significant decliners in the MENA region, having dropped five places since 2012.[9] The port institutional ecosystem -including the port authority, Customs, and other public authorities- is viewed by civil society as the embodiment of widespread government corruption. Port process digitalization will reduce this perception and increase trust in government officials via transparency and accountability. Digitalization enables remote trade transactions and prevents physical contact between public and private stakeholders, which could possibly lead to unlawful practices. Also, the consequent development of big data analytics and individual performance-based indicators (such as average processing time between inspectors) can reveal, prevent, and even predict corrupt practices that in the past could be hidden behind the vagueness of paper-enabled transactions. The port can also create alliances with global private sector collective initiatives, such as the Maritime Anti-Corruption Network (MACN),[10] and can make available its data to the public, so oversight institutions can use it to hold them to account. However, digitalization is insufficient to entirely eliminate corrupt behavior at the port and must be part of a national anti-corruption strategy which considers political and social expectations.[11]

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7   UNCTAD. 2018. Review of Maritime Transport 2018. Review of Maritime Transport. *http://dx.doi.org/10.18356/cd4440fc-en.*

8   Source: Doing Business 2020.

9   Transparency International. Corruption Perceptions Index 2020 *https://www.transparency.org/en/cpi/2020/index/lbn*

10   A global business network which includes more than 140 companies (vessel owners, cargo owners, port and maritime service providers) worldwide and works toward the elimination of all forms of maritime corruption *https://macn.dk/*

11   World Bank (2020) "Enhancing Government Effectiveness and Transparency: The Fight Against Corruption", Washington, D.C.: World Bank Group.

20. **Reduce trade costs and bureaucracy.** Process digitalization leads to reduction in transaction costs for traders. The adoption of a complete or even partial paperless environment reduces red tape, eliminates redundant paper-based documents, and makes trade cheaper and faster. In Lebanon, the cost of import documentary compliance - related to the process of obtaining, preparing, and submitting - was $135 in 2020, and the respective figure for exports was $100.[12] This is significantly higher compared to countries with advanced digital systems in place. For instance, in Singapore import documentary compliance costs $40 and export documentary compliance only $37, while the equivalent figures for the Republic of Korea were $27 for imports and $11 for exports. Combating bureaucracy and reducing trade costs will contribute to Lebanese private sector development as it will enable more small and medium enterprises to participate in international trade.

21. **Reach high levels of port service efficiency.** Port efficiency is measured beyond the mere cargo-handling capability of container terminals. A trader-oriented approach to port efficiency calls for a holistic measurement of the total time cargoes spend at the port. This is influenced not only by the technical productivity of stevedoring services but also by the efficiency of Customs controls and trade administration processes. Digitalization improves the efficiency and effectiveness of logistics services as the single electronic submission of trade and transport data allows stakeholder co-ordination toward expedited cargo inspection and release. Recent World Bank data[13] reveal that exported cargoes spend, on average, 96 hours at the PoB for inspections of Customs and other agencies, while the respective figure for the Port of Sohar in Oman is 28 hours.

22. **Increase supply chain predictability.** Availability of transparent data and information improves port planning and resource allocation. Port community members are rapidly seeking ways to electronically exchange data that can help improve overall efficiency of transactions. Integrating better estimated time of vessel arrival into software systems or predictions around estimated time of completions at the terminal can improve planning of port and maritime processes (i.e. piloting) and optimize resource allocation. Real-time information on cargo clearance progress leads to a drastic reduction of truck waiting times at the terminal gates. Beyond port operations, it improves cross-organizational coordination of activities which leads to the reduction of supply chain risks and better inventory management and control.

23. **Upgrade regulatory oversight and policy decision making.** Modern ports encourage public agencies and private operators to exchange data to improve the quality of port management and its overall performance. Effective port management requires data collection and analysis of cargo inflows and outflows throughout the entire trade and transport continuum. Turning raw data into information, via the use of traditional and predictive data analytics, enables evidence-based decision making and reallocation of resources in support of high priority services. The adoption of specialized digital platforms will enable the PoB's management as well as the sector regulator to generate a vast amount of new data which, once mined, will generate new business intelligence and insights, sometimes simply by cross-referencing databases. Availability of financial data and the concurrent obligation to publish financial accounts on a regular basis, will increase the transparency levels of port financial accounts and infuse accountability for the prevention of potential unlawful schemes.

24. **Optimize port masterplan design.** Digitalization of complex and overlapping port processes requires their upstream streamlining and re-engineering, thus eliminating the risk of digitalizing duplicate and inefficient workflows. In the context of greenfield port development, lean procedural design influences the outline of the port masterplan. The ultimate objective of master planning is to ensure how the port can provide the leanest facility to service supply chain demands and minimize the addition of excess space, resource, and financial contingencies. The focus should be on overall intra-port cargo processing, not only quay or gate productivity. The PoB explosion, despite its tragic consequences, creates an inimitable opportunity to redesign the port around essential cargo flows and reduce infrastructure and suprastructure investments to the absolutely necessary.

25. **Improve port operational security.** As in the case of the PoB, port facilities worldwide not only handle ordinary goods but also hazardous substances. Once delivered by ship, they are stored temporarily in special warehouses for dangerous goods from which they are then collected for further distribution. Taking into consideration that the PoB explosion was linked to the inappropriate storage of 2,750 metric tons of ammonium nitrate, it is important that all required measures are taken to prevent similar accidents in the future. Port digitalization and automated systems can help to make movements of hazardous substances more transparent and permit identification of dangerous levels or cases of combined storage. In addition, such systems also make it possible to check and verify compliance with the required marking and approved storage quantities.

26. **Strengthen port resilience to external shocks.** The COVID-19 pandemic disrupted procedural normality in many ports around the world. For instance, Manila's port became congested shortly after mobility restrictions were imposed in the city and yard utilization peaked at 98 percent in early April 2020, compared to the usual 60 percent. In Lebanon, as stated above, the general lockdown and closure of borders disrupted inward and outward trade flows. In contrast, highly digitalized ports managed to protect their operations from supply chain bottlenecks triggered by the pandemic.

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12 Doing Business 2020.

13 Doing Business 2020.

For instance, Rotterdam and Shanghai container throughput recovered within one to two quarters, and they registered higher throughput by the third quarter of 2020 compared to the same period in 2019. The pandemic has underscored that investing in digital port systems is a necessary condition to ensure business continuity. By saving their data in a cloud server, the LCA managed to continue with their essential operations after the blast. Similar proactive policies should be mainstreamed through the port community. Once undertaken by all government authorities operating at the port, they could dramatically increase the resilience of port operations.

27. **Avoid catastrophic cost of inaction for Lebanon's maritime connectivity.** Recent port and maritime developments in the Eastern Mediterranean have applied additional pressure to the PoB. Global shipping lines and port operators have increased their footprint in Greece (Piraeus), Turkey (Mersin), Cyprus (Limassol), Israel (Haifa), and Egypt (Alexandria, Port Said). Their investment focus extends beyond traditional port infrastructure and superstructure and incorporates initiatives for the automation and digitalization of terminal operations and port procedures. Looking beyond the immediate needs the Lebanese government should avoid the temptation to return to business-as-usual. Digitalization is a core factor and should be placed at the center of carefully orchestrated efforts to allow Lebanon to remain competitive in the region.

1.2 Digital Status Quo

28. **The current digital systems are inadequate.** The present digital infrastructure and services offered at the port do not serve the port community in the most efficient and effective manner. Anecdotal information collected during a recent WBG mission demonstrated a low level of digitalization, interoperability, and process automation between port public and private stakeholders. This dire situation has intensified recently due to the financial crisis impacting the public sector in simply maintaining the current infrastructure, and the blast which destroyed the IT infrastructure. As a result, the vast majority of the port business processes are still paper-based and conducted with limited support from automated systems. This is distant from international best practices which reveal not only a clear trend toward the development of distinct data sharing systems, but also the adoption of policies and standards to ensure interoperability. Many countries have successfully integrated national single windows (NSW) and maritime single windows (MSW) or single windows with port community systems (PCS). For instance, KENTRADE is one of the first NSWs to integrate the MSW into one platform (Box 1). Below we touch upon the status quo of existing Lebanese digital systems covering (a) maritime transport and port calling; (b) port operations of the container terminal; and (c) border management systems related to Customs and other border agencies.

BOX 1. NSW IMPLEMENTATION BENEFITS - LESSONS FROM KENTRADE, KENYA

Kenya Trade Network Agency (KENTRADE) is a state-owned enterprise established in 2011 to implement the Kenya NSW platform. The system serves as a single entry point for traders and logistics service providers to electronically approve documents and process digital payments on imported or exported goods. As of today, KENTRADE connects 37 government agencies, more than 12,000 registered users, and is operated by a team of 80 employees.

The Kenyan NSW increased the level of process automation from 11% in 2011 to 87% in 2019. This resulted in significant cost and time savings for the trading community and attracted more stakeholders to engage in trade facilitation. Its impact was summarized in a World Bank study and measured in terms of:

- Cost savings estimated at US$25.36 million as a result of reduction of traders' compliance costs.
- Simplification of processes and procedures, where the average number of steps involved in cargo clearance process reduced by almost 50%.
- Faster cargo clearance due to the adoption of document authenticity methods and elimination of paper submission requirement. Average clearance times were reduced by 32%, cargo dwell times by 39% and times to obtain pre-import and export documents by over 50%.
- Improved compliance and increased revenue collection for border agencies. The system enables early detection of non-compliant traders leading to loss of revenue. By June 30, 2018, over US$22.19 million had been collected with the majority of government agencies recording double-digit annual revenue growth.
- Reduction of corruption and improved accountability and transparency, as the system reduced and, in some cases, eliminated, human interaction between public officers and the private sector.

A. DIGITAL MARITIME SYSTEMS

29. **The current maritime digital solutions are limited to the strict minimum scope.** One of the few available solutions is the Beirut Port control database,[14] which keeps up-to-date vessel calls and daily reports but is rather simplistic in structure. The harbor master's office does not operate a Vessel Traffic Management information system (VTMIS) or a Dangerous Goods Management System (DGMS). The recently adopted mandatory requirements of the International Maritime Organization (IMO), related to ship-to-port electronic exchange of information and the subsequent development of a Maritime Single Window (MSW) solution, have not been implemented. Paper-based vessel notification of arrival provided by the shipping agent to the harbor master and pilotage station is still the norm.

30. **There is a digitalization mismatch between shipping lines and port and maritime authorities.** Despite the fact that shipping lines' digitalization is rather advanced, exchange of electronic data and information is hindered by the absence of similar solutions on the land side of port operations. Interoperability[15] is mainly limited to cargo manifest with Customs and stowage plan, container release order, container gate in gate out the container terminal. As a result, most of the data exchanges between stakeholders are still conducted on paper, such as in the case of the delivery order from shipping agents. A better but still not ideal practice is the exchange of emails with attachments, such as in the case of the dangerous good manifest, which is shared among the container terminal operator, the harbor master, and the Lebanese armed forces.

B. DIGITAL PORT SYSTEMS

31. **The container terminal operating system and the port management system are outdated.** Beirut container terminal uses a legacy system[16] which not only manages stevedoring services and yard operations but also serves as a quasi-gate control system. The PoB management and operating company[17] has functioned under an obsolete port management system environment, gradually implemented, and operated by third party contractors for the past 15 years. The system manages billing and payment of vessels and goods, port dues, as well as handling costs of the container terminal and former warehouses. The main gate of the port is managed manually by several governmental agencies which carry out physical access control and is not interoperable with any digital system. The lack of a separate truck appointment system, and the subsequent inability to control trucks' inflows and outflows, often leads to long queues of lorries waiting outside the port territory with apparent impact on urban congestion.

32. **There is a lack of a port security environment.** The PoB does not comply to the International Ship and Port facility Security (ISPS) Code[18] of the IMO, which requires minimum security arrangements for ships and port facilities. This gap is identified both at the level of required adoption of security strategies and policies as well as at the level of developing effective security plans. Security challenges also apply in the digital dimension of the port. The port lacks a digital -or even analog- "command and control" port security center in addition to the lack of an overall DGMS. At a time when cybersecurity has become number one risk for port authorities –and the port communities as a whole-, it is yet to be addressed at the PoB. As a result, there are no provisions or financial resources allocated for the hiring of a chief information security officer, while a cybersecurity operating center (CSOC) has not been implemented yet and the current port datacenter is not even physically secured.

C. DIGITAL BORDER MANAGEMENT SYSTEMS

33. **The current border management information systems are under-utilized.** Since 2011, the Lebanese Customs use the United Nations Conference on Trade and Development (UNCTAD) automated Customs management system, ASYCUDA World (AW). Prior to the blast, Customs installed a disaster recovery center to provide resilience to the Customs management system. Currently, the system no longer benefits from software maintenance services and is operated with very limited human resources. The level of automation of the SPS and other inspection agencies is rather restricted. Wherever they exist, these systems are of inadequate capability and not interoperable with each other. A

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14 Built on Microsoft Access software.

15 Via electronic data interchange (EDI) or extensible markup language (XML).

16 Old yet robust version of NAVIS SPARCS 3.7.

17 Gestion et Exploitation du Port de Beyrouth (GEBP).

18 The International Ship and Port Facility Security (ISPS) Code is an amendment to the Safety of Life at Sea (SOLAS) Convention (1974/1988) on maritime security.

border management system not integrated with other port systems and not updated to the new technologies bounds the capability of relevant agencies to detect illicit cargo or foster legitimate trade.

34. **The port blast has eliminated some of the capabilities of the AW.** The blast physically destroyed the main data center and caused Lebanese Customs to lose half of its IT power and archives of critical hard copy documents (manifests, declarations). As mentioned above, thanks to the blast-tolerant private Customs cloud system, AW did not lose any data. Lebanese Customs was also able to retrieve its lost documents from AW. According to UNCTAD, the day after the blast, the Lebanese Customs IT system continued to operate without any interruption and managed to expedite the clearance of more than 350 containers.[19]

35. **The manual procedures are still prevailing despite the availability of AW functionalities.** Submission of paper documentation is still the norm. Customs still require several physical copies of import/export declarations, contributing to already cumbersome red tape and creating the environment for corrupt practices. According to private sector operators, the average clearance time for imported cargoes is more than 11 days (see Table 1) but can often take longer due to the repetitive submissions of identical information and documents to different border agencies. The parallel submission of electronic and hardcopy documents creates obstacles and prolongs the overall clearance time.

36. **The border agencies lack a common data-collaboration platform.** Lebanon has not yet developed a National Single Window (NSW), despite Higher Council for Customs (HCC)'s recent plans to design one. The solution under discussion placed AW at the center of the NSW with the rest of the inspection and technical border agencies provided restricted access to selected data from the Customs information system. The plan required the signing of a series of MoUs: so far, only one has been signed between LCA and Ministry of Public Health (MoPH). Limited automation in SPS processes and the rest of the inspection and technical border agencies adds to the challenges and increases the complexity of future implementation. As of today, the border management community has not reached a consensus on the model, structure, governance, and architecture of the future Lebanese NSW.

1.3 Enabling Environment

37. **There is a need for improving the enabling environment.** The current Lebanese framework for port digitalization does not favor digital trade and transport operations. Therefore, port stakeholders cannot leverage existing or new digital technologies to their full potential. Implementation of the envisioned NSW, MSW, and PCS requires upgrade of the Lebanese legal, regulatory, and institutional environment at the economy-wide level. Setting up conducive primary and secondary legislation requires investing in new institutional mechanisms, including those that enable electronic transferable record[20] management and archiving, provide legal certainty and basis for electronic messages, create and empower entities that can emit electronic signatures, and put in place systems for data protection.

38. **The current digital infrastructure legal and regulatory framework is inefficient.** Lebanon is one of few countries where the government still directly owns and operates the telecommunications infrastructure. The Lebanese telecommunications market is highly regulated. Both fixed-line and mobile networks are owned by the government. The Lebanese government appears to maintain a monopoly over the internet backbone, as well as over the fixed and mobile telephone industry in general, and therefore exercises tight control over internet service providers. The Lebanese telecommunications legal framework is essentially comprised of the Telecommunications Law (Law 431/2002) which governs the telecommunications services sector and sets the rules for its transfer to the private sector. The Decree 14264/2005 specifies the administrative and financial regulations according to which the Telecommunications Regulatory Authority (TRA), created by the Law, should be managed. The TRA's regulations are still at the draft stage. Once officially adopted, they are expected to ensure a better market structure and a clearer framework for service providers. However, so far, the enforceability of these regulations is still to be confirmed.

39. **The current digital infrastructure regulatory institutions are weak.** The governance structure around digital infrastructure is comprised of three semi-independent advisory bodies that report to the Council of Ministers and regulate Lebanese media and telecommunications laws. The first two are the National Council for Audiovisual Media and the Committee for Establishing Model Bylaws and Practices, which deal mainly with audiovisual media (television, radio, and satellite). The third is the Telecommunications Regulatory Authority (TRA), which was established as an independent public institution assigned to liberalize, regulate, and develop telecommunications in Lebanon. The three

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19 *https://asycuda.org/wp-content/uploads/2020/ASYCUDA%20Compendium%202020%20-%20Lebanon.pdf*

20 UNICTRAL Model Law on ETR.

bodies are limited in their power and do not have a reputation for being particularly robust or independent, which makes the Telecommunications Ministry the de facto regulator.

40. **The Customs legal and regulatory framework is outdated.** Lebanese Customs need to improve the existing legal framework as the current Customs Law[21] is old and cannot support the strategic goals of a modern administration toward automation and digitalization. A draft new law -approved by the Lebanese Parliament but not signed by the Government yet- was developed using provisions from the EU's Customs legislation and Lebanon's existing Customs Law.[22] However, EU provisions have been directly incorporated into national law without adaption or harmonization to the national context, resulting in technical and substantive errors. The law also incorporates provisions from the EU's primary and secondary Customs regulations. Implementing measures at this detailed level are more appropriately enacted as administrative rules and regulations considering the national environment. Moreover, inclusion of such secondary legislation significantly contributes to the law's length and complexity. In addition to the use of the EU Customs legislation as a leading model for legislative modernization, the new law should include internationally recommended good practices from the Revised Kyoto Convention (RKC) and align to the WTO Trade Facilitation Agreement. The latter does not constitute a legal obligation since Lebanon is not a WTO member yet. It seems that the accession is not a priority while Lebanon's membership is not unanimously supported by all political parties. However, informally aligning policies and procedures to the WTO-TFA articles may bring Lebanon closer to trade facilitation global best practices.

41. **The Customs' institutional structure hinders the adoption and implementation of proper trade automation policies.** Lebanese Customs Administration (LCA) is comprised of (i) the Higher Council for Customs (HCC), which sets the policies, and (ii) the General Directorate of the Lebanese Customs (LCD), which performs Customs control and clearance functions. This duality has proved to be inefficient and subject to political exploitation and power struggles and it is certainly distant from what is considered international good practice. Lack of coordination and consultation between the two entities but also with trade stakeholders has led to the design of parallel policies and strategies that were never, or at best only partially, implemented on the ground. For instance, the HCC has developed a plan for the development of an ASYCUDA-centric single window which was not discussed with the LCD, nor with the rest of the border inspection agencies. Designing digital solutions endorsed by all border inspection agencies and discussed with the trade industry is a prerequisite for successful implementation. In order to achieve necessary reforms and institutional changes, LCA developed the Customs Strategy for 2021-2025. The institutional change intention was announced to the General Secretary of WCO during the course of his visit to Lebanon in September 2020. However, both the Customs Strategy and the Customs institutional reform are on hold, due to absence of the government's ability to approve the reform process.

1.4 Obstacles to Change

42. **There is a clear absence of political will and ownership at the highest level.** Lebanon lacks sustained political support to undertake the changes in magnitude required. The success of digitalization initiatives requires gradual, incremental action on multiple fronts to bring stakeholders around to investing in the underlying strategic vision for port-led maritime trade and a collaborative mindset, the techno-legal framework, and organizational structure. Political support at the highest level will help maintain the momentum of reform-oriented actions, including the passage of regulatory norms, investment proposals, and structural changes at the port community level.

43. **The public sector decision-making process is complex.** The implementation of digital solutions requires seamless collaboration between a number of core ministries and public agencies to ensure the formulation of common strategic goals and coordination mechanisms for the achievement of operational tasks. The complex Lebanese political structure, combined with the inherited political culture of isolated decision making, hinders smooth digital policy design and implementation. Unless necessary tools and mechanisms are put in place to ensure coordination between the Ministries of Telecommunications, Finance, Public Works & Transport, and Economy & Trade,[23] the chances of reaching high levels of effective port digitalization are slim.

44. **Rent-seeking and informal economic structures are the norm.** Private sector perceptions of public agencies are centered around the notions of corruption and informality. Mistrust between traders and public authorities is reinforced by the belief that things can only change marginally, and rent-seeking activities will prevail. The infusion of trade automation and the application of digital systems, by definition, create an operational buffer zone between the public

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21 Decree No. 4461.

22 Draft Customs Code (2015) was designed in the context of the "Modernized Clearance Processes" twinning project delivered by Italian Customs.

23 But also, the Ministries of Health, Agriculture, Industry, Immigration, Defense, Interior, Foreign Affairs, and Digital Affairs.

and private sector. Therefore, the chances for corrupted, unlawful practices and misconduct decrease significantly. Digitalization could enable the transition from informal to formal transactions at the PoB but, in order to be effective, it should be implemented in parallel with the adoption of concrete anti-corruption policies and strategies touching across various sectors of the economy.

45. **Consultation with the trade and transport industry is limited.** Recent initiatives to promote automation in Lebanon were characterized by a top-down approach in their conceptual design. Public entities tend to propose discrete solutions, based on their operational objectives and fulfillment of their own corporate goals. This mentality ignores the views, perceptions, and insights of the port community members, whose operations are expected to be affected. Missing the opportunity to incorporate their opinions -at minimum during the design phase- increases the risk of ending up with a solution that does not meet the practical needs of the industry. To effect change to longstanding policies and practices, public and private sector agencies need to jointly put their weight behind the digitalization initiatives covering technological investments and changes in the port's regulatory environment and procedures.

46. **There is a lack of digital trade port vision and strategy. In Lebanon,** there is general awareness and appreciation for the true potential of the adoption of contemporary digital platforms in the port and maritime sector. However, so far, there have been no facilitated efforts to develop a coherent vision of digitally connected port participants to share data and information, resulting in optimal transport and cargo flows. At an economy-wide level, the Lebanese government raised the profile of "digital transformation" discussions and developed a strategy paper,[24] which makes sound suggestions at a high level, but does not recommend specific sectoral plans. In 2018, the Office of the Minister of State for Administrative Reforms (OMSAR) announced the Lebanon Digital Transformation Strategy, but the strategy does not contain a comprehensive plan for port logistics and the international trade sector[25]. In fact, it is focused on the technological aspects of digital transformation and not on the strategic and policy aspects that drive digital transformation in each of the sectors.

24 The Road Towards Digital Transformation: Realizing the Potential of the Lebanese Knowledge Economy, Action Plan of the Ministry of State for Investments & Technology 2019-2021.

25 A new strategy that will be released imminently by OMSAR: *https://omsar.gov.lb/Digital-Transformation/Strategies/Lebanon-Digital-Transformation-Strategy*

2. Port & Maritime Digital Trade Solutions
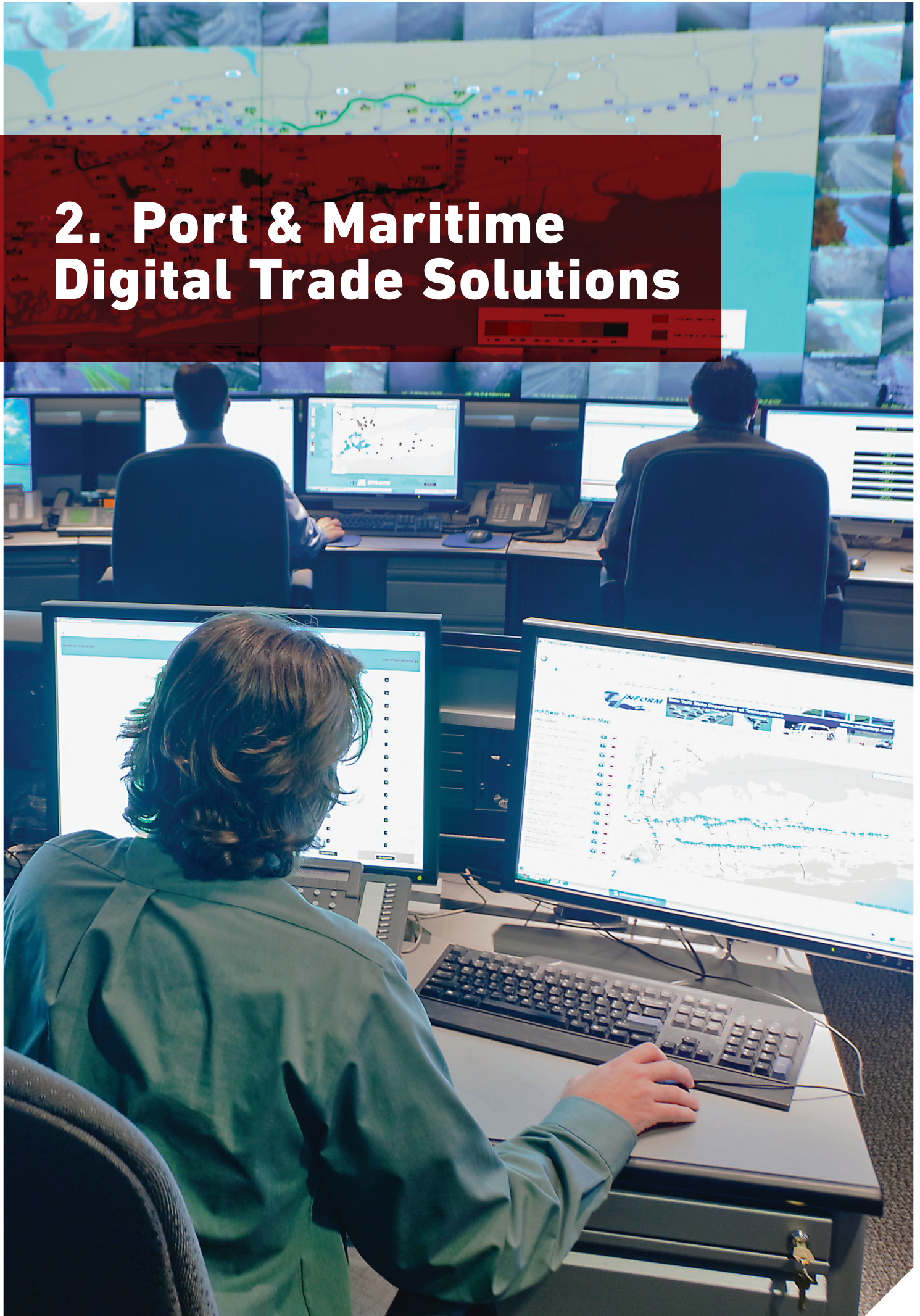
2.1 Port Digitalization Global Trends

47. **Rapid technological evolution transforms the port logistics sector.** Port digitalization evolved from a mere electronic data interchange system to sophisticated intra and inter-port digital solutions. While ports in the developing world strive for mere automation of terminal operations and cargo clearance processes, port digitalization in developed countries has evolved into the Smart Port concept, in which digital platforms capture information and Internet of Things (IoT) networks, artificial intelligence (AI), big data, and blockchain. Technology has pushed the limits of digitalization and blurred the digital and physical worlds. Data availability on physical objects (cargoes, containers, packages, vessels) in real-time is a commonplace phenomenon, transforming the port logistics industry, offering unprecedented opportunities for efficiency and optimization, and transforming ports from cargo to digital hubs.

48. **Public agencies struggle to catch up with rapidly evolving industry.** Private sector process and operational digitalization has gained in focus, demonstrated by specific initiatives, ranging from platforms and portals, to data sharing efforts, new monitoring systems, vessel automation, and cybersecurity strategies. However, the digitization of transport and trade compliance and regulatory agencies is still lagging behind. Automation levels mismatch between public and private sectors, creating serious bottlenecks and port logistics inefficiencies reflected in increased waiting times at the port gates and lack of predictability in terms of vessels' estimated arrival times.

Figure 2. IAPH Maritime Trade Logistics Digitalization Road Map
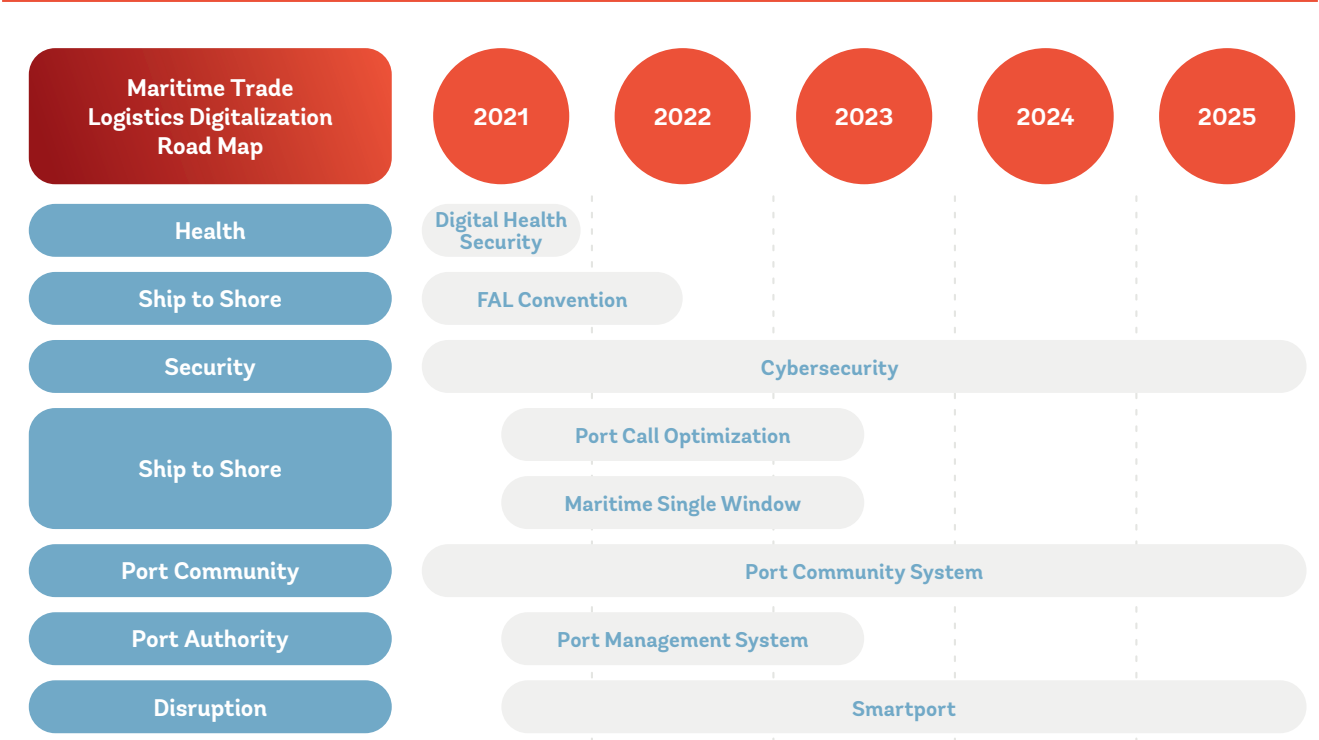
49. **Digital transformation forces ports to rethink their investment plans.** Landlord ports adapt -slowly but steadily- to the new reality in which the best way to compete and be more efficient is not only related to geographical location or infrastructure provision but also the capacity to manage, administer, and provide data and new digital services to the port clients and users. As the degree of digital transformation has become an increasingly important criterion for port choice, port managers need to rethink their investment plans, reconsidering the financial resources that they annually allocate to the technological evolution of their service portfolio as one of the essential pillars of their business strategy.

50. **Digitalization extends beyond the port terminal operations.** The interest in process automation does not stop at the yard gate and the quay wall. Modern ports are holistically focused and active enablers of supply chain network performance. The IAPH and the World Bank jointly outlined a number of critical steps that need to be taken by ports in order to effectively digitalize maritime trade logistics (**Error! Reference source not found.**). This roadmap can be adjusted to the institutional complexity of each port community and enhanced in a way to incorporate Customs and

other border management digital solutions. Smart ports become vital logistics information hubs, as they possess critical knowledge about when goods arrive or pass through their facilities, and as a result they also serve local and regional supply chain ecosystems beyond their strict physical boundaries.

2.2 Port & Maritime Data Collaboration Platforms

51. **Emerging data-collaboration platforms are driving the port and maritime sector**. Data-collaboration platforms take the form of either single windows or community systems. The former are government-mandated single-entry points for data, which allow for the submission of information to fulfill regulatory requirements between economic operators and government authorities. The latter handle electronic communication in ports between private transport operators, the hinterland, importers and exporters, the port and maritime authorities, and other public agencies. In practice, single windows and community systems often co-exist. This co-existence generates the necessity for data interoperability, to ensure single submission of the same information.[26]

In this context, data-collaboration platforms take the form of three similar but distinct digital structures:

- **Maritime Single Window (MSW)** is a digital environment which allows the submission to a single-entry point of standardized and harmonized information -related to the ship, cargo, crew, passengers, and baggage- that public authorities require from ships upon arrival or departure from a port. The MSW fulfills the FAL Convention's new mandatory requirement for governments to set up electronic exchange of information for clearance processes in ports and its recommendation to use the single window concept.

- **Port Community Systems (PCS)** is a neutral and open electronic platform enabling intelligent and secure exchange of information between port stakeholders to improve the competitive position of the port community as it optimizes, manages, and automates port and logistics processes through a single submission of data.[27]

- **National Single Window (NSW)** is defined as facilities that allow parties involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfill all import, export, and transit-related cargo clearance regulatory requirements.

A. MARITIME SINGLE WINDOW

52. **The era of ship-to-shore data exchange has arrived**. The IMO FAL Convention establishes the mandatory requirements[28] for the electronic exchange of information to assist ship clearance processes in ports, obligating public authorities to establish systems for the electronic exchange of information. In 2019, the IMO FAL Committee approved and issued guidelines[29] for setting up a MSW platform, enabling intelligent and secure exchange of information between public and private stakeholders related to the arrival, stay, and departure of ships nationwide. Its implementation facilitates ship clearance processes in ports through the mandatory establishment of MSW platforms. In addition, the IMO, in partnership with the WCO, UNECE, and ISO, has developed the IMO Compendium on Facilitation and Electronic business. The IMO Compendium consists of an IMO Data Set and IMO Reference Data Model agreed by the main organizations involved in the development of standards for the electronic exchange of information related to the FAL Convention: the World Customs Organization (WCO), the United Nations Economic Commission for Europe (UNECE), and the International Organization for Standardization (ISO). The Compendium provides a common definition and representation for all data elements related to the ship reporting requirements, allowing for interoperability of standards and thereby of the systems of different stakeholders involved in clearance.

53. **The MSW is defined as a facility that allows submission of standardized information to a single-entry point**. Clearance processes can be facilitated by combining common and harmonized data elements into a single message according to commonly agreed standards and format and sent electronically to a single official destination, rather than being sent to each authority separately. Figure 3 offers a description of a typical MSW. The FAL Convention standardizes and harmonizes the documents that public authorities usually ask of a ship reporting at a port. It reduces to 12 the number of documents which can be required by public authorities. In addition, the IMO mandate on governments to

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26 United Nations Centre for Trade Facilitation & Electronic Business (UN/CEFACT), 2005.

27 According to the definition of the International Port Community Systems Association (IPCSA).

28 *https://www.imo.org/en/OurWork/Facilitation/Pages/FormsCertificates-default.aspx*

29 *https://wwwcdn.imo.org/localresources/en/OurWork/Facilitation/FAL%20related%20nonmandatory%20documents/FAL.5-Circ.42.pdf*

establish facilities that enable electronic exchange of the information identified in these documents presents a unique opportunity for the maritime trade to fully digitalize its operations. Countries bound by the FAL Convention will be able to use standardized digital reporting specified by the convention (Table 2). Since 2018, additional declarations were included,[30] namely the (a) security-related information as required under SOLAS regulation XI-2/9.2.2; (b) advance electronic cargo information for Customs risk assessment purposes; and (c) advanced notification form for waste delivery to port reception facilities.

Table 2. IMO's Standardized FAL Forms

| IMO Form	Entities Require Same Documents				
	Customs	**Immigration**	**SPS**	**Port Authority**	**Maritime Authority**
Form 1 - General Declaration	X		X	X	X
Form 2 - Cargo Declaration	X		X	X	
Form 3 - Ship's Stores Declaration	X			X	
Form 4 - Crew's Effects Declaration	X			X	X
Form 5 - Crew List	X	X		X	X
Form 6 - Passenger List	X	X		X	X
Form 7 - Dangerous Goods	X		X	X	X

54. **The emergence of national and regional maritime single window initiatives is a priority.** In line with this concept, in 2002 the EU introduced rules obliging ships calling at EU ports to provide the required information on the standardized IMO FAL forms to facilitate maritime transport in European waters. These rules were later replaced by Reporting Formalities Directive 2010/65/EU (RFD). In 2019, the EU Parliament approved Regulation 2019/1239[31] establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU. Norway has also set up its MSW, called the SafeSeaNet Norway (SSNN), and building on this experience, provided technical assistance jointly with the IMO for the development of an open-source MSW in Antigua and Barbuda, allowing ship data providers to make the relevant operational information available to the port authority, terminal operators, stevedores, freight forwards, and Customs. Panama also implemented VUMPA, a MSW, in 2017, bringing vessel declaration from 20 minutes to none with full automation, saving 300,000 paper forms and documents.

55. **Best practice MSWs can spur successful trade facilitation programs.** In fact, MSW projects are aligned in principle with some of the key measures of the WTO Trade Facilitation Agreement (TFA). Article 10.1 requires periodic review of forms and formalities with a view to simplifying and decreasing in the light of "changed circumstances, relevant new information, business practices, availability of techniques and technology, international best practices, and inputs from interested parties". The above initiatives do recognize new realities and aim to produce simplified procedures. The use of IMO FAL Forms as the basis for maritime and Customs reporting involves the use of UN and WCO standards, and that is encouraged under Article 10.3 of the TFA. In the above cases where it is sought to eliminate duplicate reporting of the Cargo Manifest, it follows the principles laid down in Article 10.4 of the TFA.

Further, harmonized cargo manifests, when received well ahead of vessel arrival, will certainly contribute to pre-arrival processing (Article 7.1) and risk management (Article 7.4). With the port authority, maritime police, Customs, health authorities, waterways authority, immigration, and health authorities closely involved with the implementation of the MSW, it is also an example of border agency co-operation. The implementation of the MSW will also require the implementation of a Vessel Traffic Management information system (VTMIS) to integrate and interconnect all the relevant assets to manage maritime operations safely and securely. This includes management of maritime operations from marine environmental protection to traffic management, law enforcement, and security at sea.

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30 Maritime Declaration of Health (IHR) and documents under Universal Postal Convention for mail may also be required.

31 Regulation (EU) 2019/ of the European Parliament and of the Council of 20 June 2019 establishing a European Maritime Single Window environment and repealing Directive 2010/65/EU (europa.eu).

Figure 3. Maritime Single Window
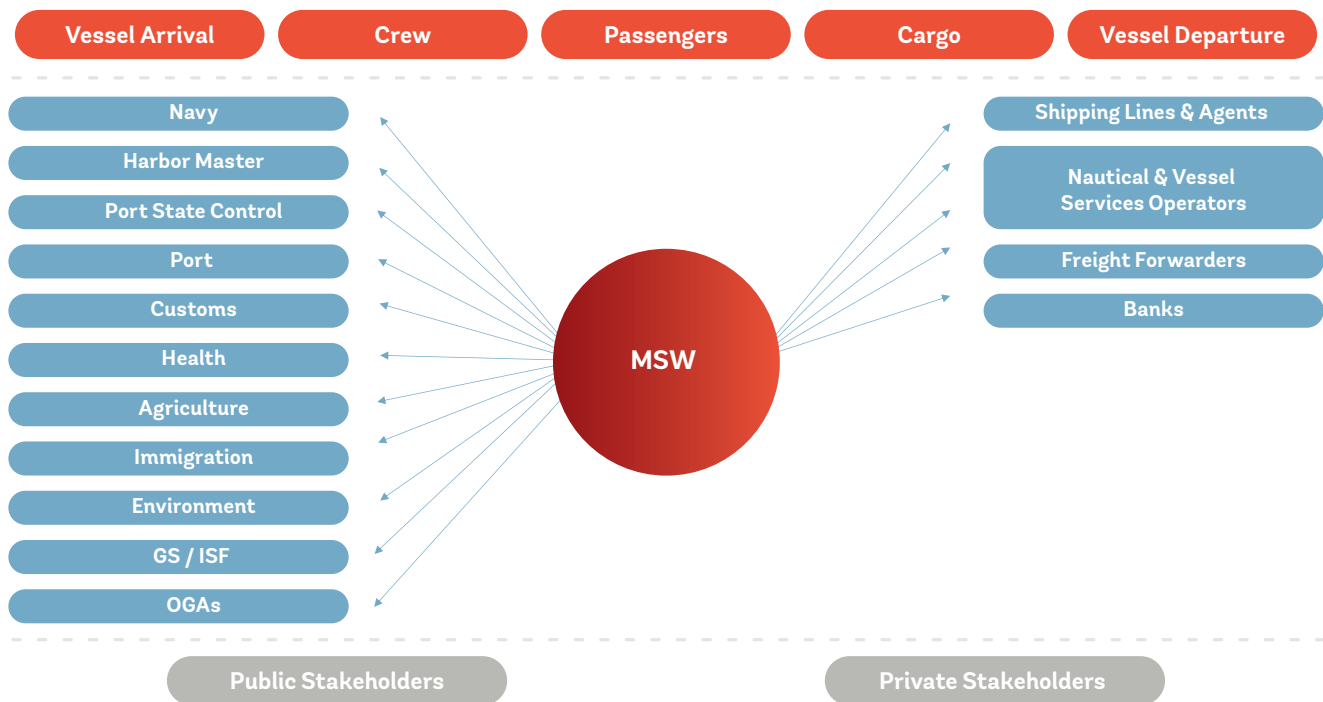
B. PORT COMMUNITY SYSTEMS

56. **The Port Community Systems (PCS) are electronic platforms automating port processes.** PCSs represent an integrated approach to delivering digitally enabled services to users of the port. The international port community systems association (IPCSA) has defined PCS as a neutral and open electronic platform enabling intelligent and secure exchange of information between public and private stakeholders in order to improve the competitive position of the sea and air ports' communities. It optimizes, manages, and automates port and logistics processes through a single submission of data and connecting transport and logistics chains. PCS acts as a trusted third party to exchange real-time data.

57. **PCS is another form of electronic single window.** Transactional data, once submitted, helps drive a broad range of business process automation. A PCS is modular in design and construction, and comprises functional modules representing groupings of services. PCSs are characterized by the services they provide to users. The functional services covered by a PCS can be divided into the following five categories, based on services in support of (a) maritime operations – these are broadly related to port call, advance vessel information; (b) port operations – loading and unloading of cargo at terminals, cargo delivery, gate management, temporary storage, empties depots; (c) hinterland operations – inward and outward movement of cargo using different means of transport (rail, road, and waterways), bonded warehouses, free zones, inland terminal; (d) on shore regulatory services – other regulatory services based on shore covering vessel security, waste disposal, dangerous goods, veterinary and sanitary inspections, harbor and port dues collection, vessel inspection, etc.; and (e) transverse services – billing and e-payment of public and private stakeholders, supply chain key performance indicators (KPI), port information portals providing operational and practical information to all port users, such as service hours, vessel arrival schedules, port tariff, and gate waiting times. A typical structure of a PCS is found in Figure 4.

Figure 4. Port Community System
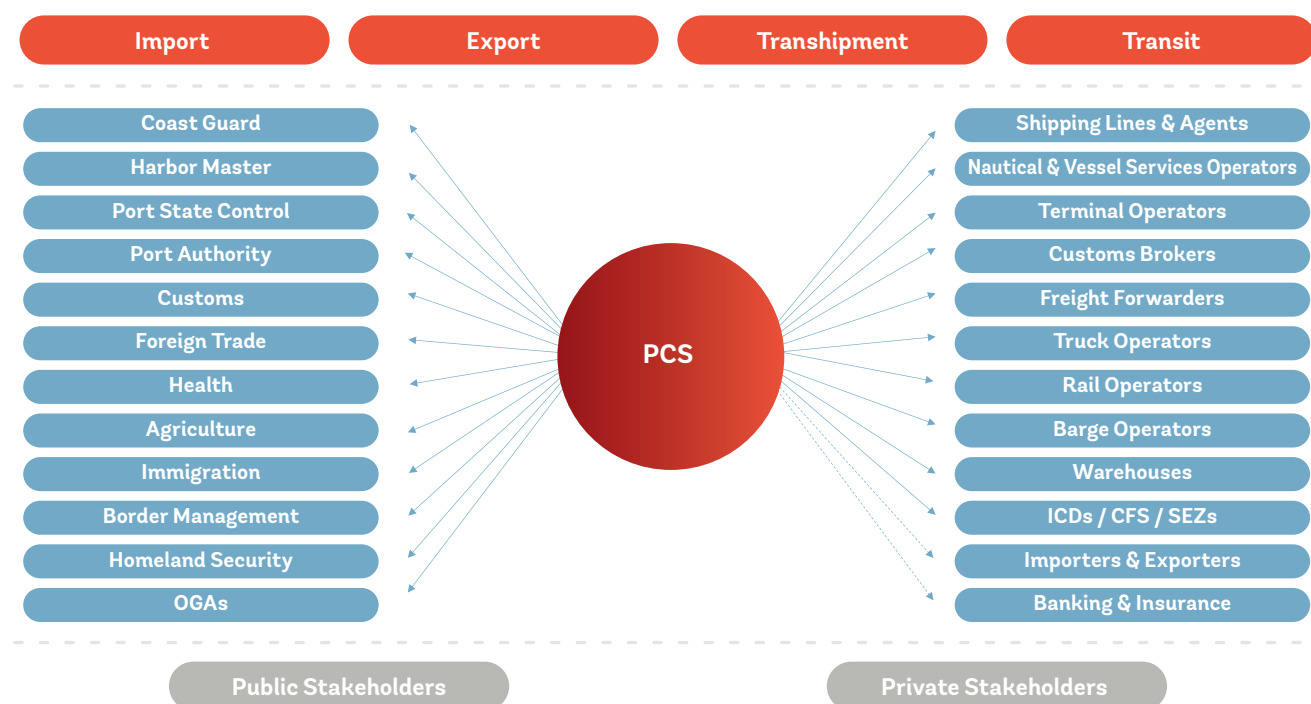
58. **PCSs have developed globally as integral interoperable components of international supply chains.** These are digital logistics platforms dedicated to the management of trade logistics at port and in the hinterland. They are established for a specific purpose of public-private data collaboration. Information handled aims at enabling a variety of decisions related to freight operations, including deliveries, loading, unloading, docking sequence, truck appointment management, or cargo tracking and tracing. In addition, trade compliance agencies, including Customs, are often –but not always- included in the port community ecosystem and may use their data to manage regulatory control activities.

59. **There are strong linkages between PCS and NSW systems.** While it is true that PCS has traditionally grown as a port-of-entry data-collaboration platform, it has also moved national platforms to manage all seaports, inland ports, river and lake ports, land border ports, and airports, such as in DRC. Integration between PCSs and (maritime or trade) single windows can create optimal benefits for all stakeholders involved. A PCS is a natural 'Gateway to a National Single Window'[32] where the objectives of government, private sector, and ports are realized. The same applies with regards to the complementary roles of PCSs and MSWs. Many countries have adopted policies that include provisions from the effective merger of the two systems for the end-user's benefit. For instance, Djibouti managed to implement MSW and PCS under one system in about three years while facing issues on the legal framework (Box 2). Therefore, countries could consider PCSs and NSWs to jointly form part of a larger national strategy for trade facilitation and logistics improvement. It would help to have a common understanding on the potential interactions between PCS and NSW systems and how such interactions can improve trade facilitation and logistics efficiencies. This would help in convincing governments and private sector stakeholders to pursue investments in this space.

C. NATIONAL SINGLE WINDOW

60. **National Single Window (NSW) is an electronic platform enabling intelligent and secure exchange of information between trade and governmental agencies**. It focuses on upstream trade procedures, notably import licenses and permits, control, and technical inspections, but also on the clearance of goods at sea ports, airports, and land border ports. NSW aims to substantially improve the performance of cross-border regulatory agencies, including their ability to control goods effectively. NSW will also help significantly reduce the costs of compliance for all businesses involved in the cross-border trade of goods. United Nations Economic Commission for Europe (UNECE) Recommendation No.33 defines a "single window" as an electronic facility providing trade facilitation measures that allows parties

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32 *https://ipcsa.international/publications/epcsa-white-paper-pcs-and-sw/*

involved in trade and transport to lodge standardized information and documents with a single-entry point to fulfill all import, export, and transit-related regulatory requirements. Individual data elements should only be submitted once electronically. A single window implies a single submission of data and information, whereby each separate data item on the release/clearance of a shipment is only required to be supplied once (whether by a commercial operator or a government agency). A single window handles data only once for a specific release/clearance process by government agencies. Where multiple clearances are involved, the single window synchronizes the activities associated with those clearances. This leads to single, streamlined decision making for Customs release and clearance of cargoes. Customs grants clearances based on decisions taken and recorded by the respective agencies on a single window.

61. **The NSW connects all public and private stakeholders involved in the cargo clearance process**. NSW is principally a tool for trade facilitation and compliance. An NSW requires government agencies' continued support and the active participation of key stakeholders in the trade and logistics community. A typical structure of a NSW is found in Figure 5. Businesses should accept NSW as a facility that saves costs and preserves the value in a supply chain. Apart from the participation of the relevant government authorities and support from the business community, NSW requires the strong political will of government. NSW governance processes such as stakeholder engagement and program management are among the key success factors.

62. **The implementation of NSW will provide numerous trade facilitation benefits.** NSW will benefit business by creating a better understanding of regulatory requirements, help improve the predictability of clearance processes, facilitate pre-arrival processing, improve compliances, and lower costs. NSW will provide holistic information on consignments, enabling thorough risk assessment and increased transparency. NSW implies public-private data collaboration based on trust and sustainable good practices at borders. NSW helps speed up the administrative and operational processes covering release and clearance of cargoes by automating the pre-clearance formalities, and thereafter facilitating border clearances.

BOX 2. PCS & MSW FUNCTIONAL INTEGRATION: THE CASE OF DPCS, DJIBOUTI

In July 2018, Djibouti Ports and Free Zones Authority (DPFZA), a governmental entity that manages Djibouti's ports, established the Djibouti Port Community System Operator (DPCS). The goal of the new entity was to coordinate, simplify, and streamline import, export, and transit processes through national ports, airports, and regional economic corridors. DPCS is connecting three terminals, three free zones, two corridors, four governmental agencies, five banks, and all shipping agents and freight forwards.

The adopted strategy included the integration of the PCS and MSW into one platform with an implementation organized in two phases. The first phase concentrated on vessel management, while the second phase focused on vessel services and container management.

Challenges faced during PCS implementation included the availability of limited human resources, inadequate ICT and power infrastructures, resistance to change by stakeholders and delays in the enactment of essential legislative framework. DPCS outsourced required skills and organized targeted trainings to: (i) enhance stakeholder familiarity with the PCS; (ii) strengthen confidence in its value addition; (iii) demonstrate its benefits; and (iv) accelerate its effective legislative adoption.

Requests via DPCS DPFZA can be submitted on a 24 hours per day basis while service providers (port operators, port authority, free zone authority, corridor agency) are given a one-hour time limit to respond.

The program's biggest success is the reduction of berth allocation time from three days maximum to one hour. DPCS has eliminated manual processes for the in-person submission of port clearance certificates, invoices, crew and passenger list for immigration and shore pass required for shipping agents. DPCS has also allowed terminal operators to be notified at the time of delivery order, thus allowing them to better plan for cargo handling and distribution.

Figure 5. National Single Window
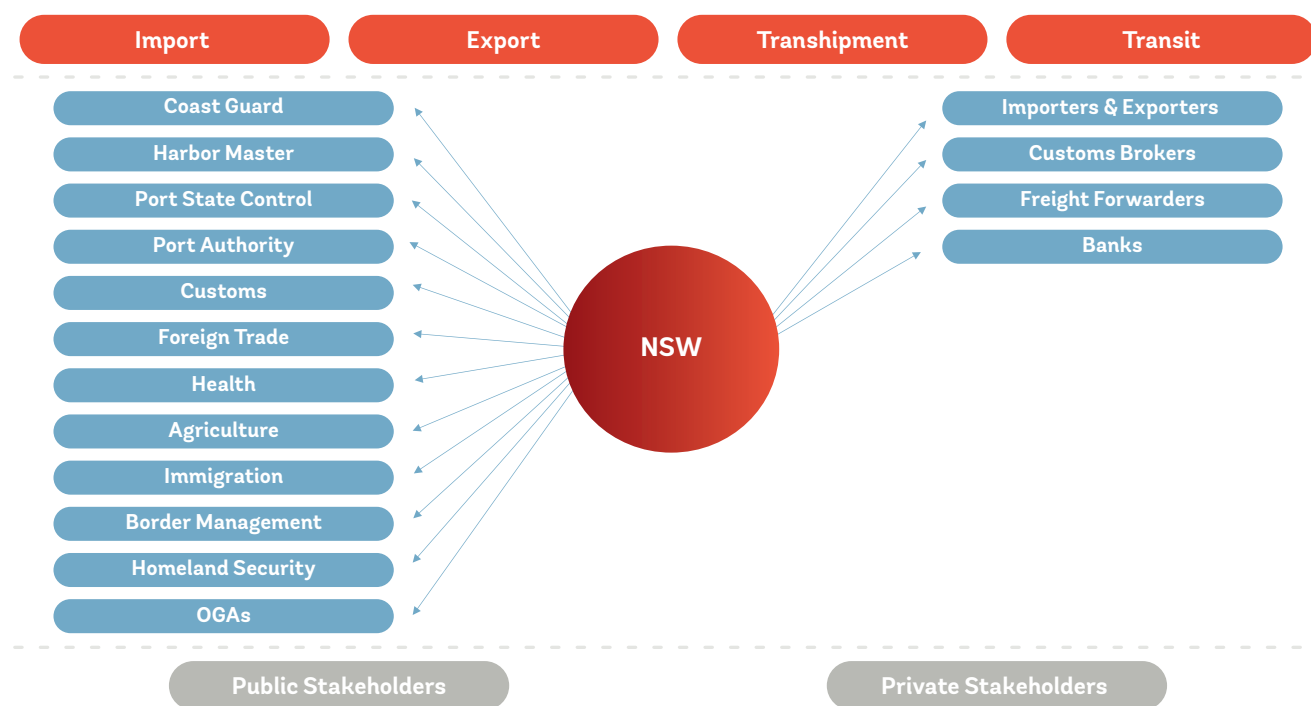
63. **An NSW is required to implement the digitalization of all processes enabling cargo clearance.** Partial efforts at automation are unlikely to produce results because the digital supply chain is only as strong as its weakest link. Digitalization within a NSW must cover the whole range of pre-arrival and "at arrival" border processes. Pre-departure processes should cover traders' registration, common to all agencies, and allow all agencies to share trader profiles. The NSW should digitally provide authentic information on regulatory processes for any commodity. Pre-arrival processes include import, export, and transit declarations, electronic reporting of cargo and passenger manifests, and electronic handling of transshipment requests. NSW should digitally receive, process, and issue licenses, permits, certificates, and other regulatory authorizations, including Certificates of Origin and SPS certificates. NSW should accept and utilize new data sources to provide continued supply chain visibility to traders, logistics providers, and regulatory agencies. Visibility should ideally cover the geographical location and velocity of cargo and means of transport, condition of cargo (temperature, humidity, seal integrity), traffic conditions, waiting times, and regulatory status. The "at arrival" border processing includes integrated risk assessment, automated cargo selectivity for inspection, testing, electronic payment processes, automated release, and clearance of cargo. The entire process should be digital, and the trader or transport operator should routinely never have to present a piece of paper by way of information and documentation.

64. **Trade is moving toward a modern single window environment.** The WCO elaborates on the UN/CEFACT Recommendation 33 definition through the term 'Single Window Environment',[33] and calls attention to the fact that the 'Single Window Environment' is, in fact, an 'intelligent' facility, that allows parties involved in trade and transport to lodge standardized information, with a single-entry point to fulfill all import, export, and transit-related regulatory requirements. It is called an 'environment' because it has been widely observed that Single Window implementations are usually a federation of interdependent facilities joined by mutually defined interfaces and collectively adopted business processes – i.e. a system of systems. Single Window projects are often implemented in phases that sometimes extend beyond five years. Each phase and sub-phase builds upon the previous phase, leading to progressive simplification for trade and more processing elements within the environment. The eventual outcome may not be the result of a single project but could be the outcome of a series of projects.

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33 *http://www.wcoomd.org/-/media/wco/public/global/pdf/topics/facilitation/instruments-and-tools/tools/single-window/compendium/swcompendiumvol2all-parts.pdf*

2.3 Contemporary Challenges of Digital Platforms

65. **Digitalization engenders the need to adjust port governance.** Rapid port digitalization forces port authorities to rethink their role and undertake new responsibilities. Adoption of data-sharing technology in the sector raises questions about the need for data confidentiality and governance. This is becoming an important issue and, if left unchecked, it entails several risks for the port community. Platforms are required to provide digital trust and governance such that data contributors are able to address concerns around data ownership and use. Port management itself must be rethought, orienting the offer of services toward new innovative schemes that allow it to continue being competitive and attractive for its clients and users. Those ports that understand this new philosophy and allocate the necessary resources and efforts to achieve these objectives will undoubtedly be better positioned than those that continue to maintain the business-as-usual model.

66. **Digitization redefines jobs and this can lead to discontent.** Automation re-defines jobs and can lead to discontent, but this is a myopic way of looking at port automation. Managing the transition from strength to skill, from manual to automated, and from mechanical to digital entails fewer traditional capabilities but still requires a human touch. Automated ports will always require the skills, insights, enthusiasm, and experience that current workers can bring to the table. In this context, it is rather important that ports regularly include all workers in its thinking and digital strategy. The port of Hamburg provides a best practice example of communicating deeply and frequently planned changes with the port community. In reality, port digitalization will create more skilled and specialized jobs leading to higher salaries and promising careers. In fact, one of the top problems digital ports face is the difficulty to fill specialized technical positions either through talent acquisition or training and capacity building.

67. **Smaller port stakeholders should not be left out.** A continuously changing business environment requires that the SMEs are digitally connected for data sharing. While 20 percent of stakeholders are responsible for 80 percent of the transactions through a PCS, 80 percent of stakeholders account for 20 percent of transactions. Incentivizing smaller companies to participate strengthens the concept of the port community. Large stakeholders have the financial resources to acquire the IT connectivity they could need. But smaller stakeholders – agents, importers, truckers, warehouse operators – often do not have that ability. Bearing in mind these 'have nots', digital systems should be designed to ensure the participation of smaller port stakeholders.

68. **Automation prior to process optimization imposes vast risks.** While many believe the best way to modernize is to automate immediately, beginning digital transition before thoroughly understanding and simplifying current operational process can lead to less than perfect results. If port processes are error-prone and inefficient, direct digitalization will automate these problems, leading to poorer performance. However, process optimization requires process identification across end-to-end intra-port logistics chains. In a cross-organizational environment, in which ports operate, focus on process orientation and breaking down silos between functions is always a challenge.

69. **Cybersecurity measures should be taken to ensure data integrity.** Between February and May 2020, cyberattacks increased 400 percent[34] in the maritime industry. In 2017, global container shipping company Maersk and its international port operation wing experienced an aggressive cyberattack, while in 2020, MSC, a global container shipping company, had its digital tools and website hacked. Since then, several other large shipping companies have discovered cyberattacks dating back over the past three years—and most certainly, more attacks will come. In 2019, the European Union Agency for Cybersecurity (ENISA) warned that cyberattacks on PCSs could lead to the physical shutdown of port operations, with all the concomitant impacts on food security, business continuity, and trade costs. Members of the port community ecosystem should take measures to reduce their own port ecosystem cyber risks by putting together a comprehensive cybersecurity framework. The five-step cybersecurity framework[35] developed by the United States National Institute of Standards and Technology (NIST) is one example for identifying and mitigating cyber risks. To lead this effort, port authorities have been inherently endowed with a natural and neutral orchestration role. The Port of Los Angeles provides a good example of a port community cyber defense scheme.

70. **Interoperability of data-collaboration platforms is multilayered.** Public-private data-collaboration policy frameworks require the establishment of data governance and orchestration of data. Information Interoperability[36] is the ability of organizations to interact toward mutually beneficial goals. Interoperability works at four distinct layers:

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34 Captive International. 2020. "Maritime Businesses See Fourfold Increase in Cyber Attacks Since February: Astaara." June 23, 2020. *https://www.captiveinternational.com/news/maritime-businesses-see-fourfold-increase-in-cyber-attacks-since-february-astaara-3568*

35 NIST's Cybersecurity Framework, *https://www.nist.gov/cyberframework/new-framework*

36 European Interoperability Framework. (n.d.). *https://doi.org/10.2799/78681*

- **Legal interoperability** ensures the legal value of shared information. In a digitalized environment, information will be shared across multiple organizations and multiple national jurisdictions. Data shared on digital maritime platforms will be used by a variety of public and private organizations and should serve their legal purposes.

- **Organizational interoperability** refers to organizations participating in data exchange aligning their business processes and functional responsibilities and their business goals to achieve service level expectations. In the context of a digital maritime platform, the participating organizations pursue organizational interoperability to ensure consistent service offerings to platform users.

- **Semantic interoperability** covers the meaning and format of interchanged data to ensure that the sending and receiving organizations understand the data and information shared in the same way. Therefore, for several decades, international organizations such as the UN, ISO, the WCO, and the IMO, have been working on the semantic and syntactical aspects of data interchange. Digital platforms in the maritime domain are now invariably designed according to international data standards to ensure semantic interoperability.

- **Technical interoperability** covers the ability of ICT systems to work together, both at the software and infrastructure levels. Organizations participating in the maritime digital platforms need to exchange information based on agreed technical interfaces. Technical interoperability ensures that the technical specifications are defined to ensure seamless interchange of data.

3. Port of Beirut Digitalization Action Plan

3.1 Implementation Pillars

71. **The PoB digitalization action plan requires to define the three pillars of digital platform implementation.** In the new era of digital ports, operational performance is not only dependent on the scale of the physical infrastructure. Ports need to invest in hard and soft digital infrastructure in order to better manage the processes defined by physical assets. Beyond infrastructure, there is an apparent need to develop the appropriate institutional and legislative framework in support of its seamless and effective functioning. Finally, high levels of automation do not preclude the need to rely on the human factor. Modern ports' employees require (a) upgraded skillsets to be able to adequately handle the new technology, and (b) the ability to keep up with short cycles of technological developments. In a nutshell, the success of a successful digital implementation action plan largely depends on the following three building blocks (pillars):

    • **Institutional pillar:** The first pillar reflects the enabling environment, i.e., the legal, regulatory, and institutional framework in support of public-private data-collaboration policies and operational efficiency and sustainability of digital solutions.

    • **Digital pillar:** The second pillar refers to the required digital solutions, tightly linked to the secure and efficient design of the port's physical assets and designed to contribute to the delivery of cost-effective port logistics services.

    • **Human Capital pillar:** Finally, the third pillar focuses on the human capital, technologically skilled ICT labor, and the spectrum of technical and other capabilities required to adopt, implement, innovate, and maintain new information technologies in the port logistics sector.

3.2 Digitalization Action Plan

72. **Translating international best practices into successful national implementation.** This paper outlines key principles for successful implementation of port digital solutions, based on lessons learnt from international experience. These offer useful guidance for Lebanese policymakers to successfully implement required changes. However, the fact that certain policies have worked in other countries does not guarantee that they will also work for Lebanon. Lebanese officials should filter this knowledge and customize it -to the extent possible- to the national political and economic context and the specific requirements of the PoB. For this purpose, a number of diagnostics and studies should be developed upstream to identify existing gaps and inform activities in each of the implementation pillars.

73. **Looking beyond the mere IT infrastructure development.** Digital port solutions should not be narrowly perceived as a pure IT port infrastructure project. Their successful implementation largely depends on the concurrent adoption of structural reforms in the port management, trade facilitation, and national digital infrastructure domains. Global experience has revealed that the installation of community systems and single windows software and hardware is not sufficient to generate expected results, if not accompanied by essential reforms at legislative, institutional, and operational levels. The Lebanese government should prioritize and sequence infrastructure development activities in a way to allow for the concurrent strengthening of the enabling environment.

74. **Securing political commitment at the maximum level.** High-level political commitment should drive the change management process toward full and effective implementation. In practical terms, execution responsibilities are spread among various ministries, a fact that requires close coordination and collaboration. In politically fragile environments, such as in Lebanon, securing the support of all political parties is a necessity rather than an option. High levels of political complexity -often based on communal and partisan affiliations, conflicts of interest, and issues related to the multifaceted public and private stakeholder environment- make the task of consensus nearly impossible and significantly increase the risk of losing financing. The adoption of the digital agenda by the office of the Prime Minister, once appointed, would be a sign of firm political pledge.

75. **Designing a digital port vision endorsed by the port community.** Equally important is the design of a plan, via a bottom-up consultative process, which takes into consideration the views and concerns of the port users and end-beneficiaries. Digitalization does not only concern port or maritime authorities, but it affects the operations of the port community as a whole. Therefore, any plan to change the current modus operandi and strategically infuse automation and digital solutions will have to be backed up by a unified vision and community consensus. This includes an agreement on a realistic future vision and governance structures, with clear roles and responsibilities for all key stakeholders.

STRENGTHENING THE ENABLING ENVIRONMENT
(INSTITUTIONAL PILLAR)

76. **Re-activate legal reforms in the Lebanese ICT sector.** Proposed data-collaboration structures require modern ICT and ultra-fast broadband services which allow reliable real-time data exchange. Lebanon's telecommunications market is mostly controlled by the state and its liberalization, although stipulated in Law 431/2002, is yet to be effective. As a result, Lebanon suffers from unreliable internet services, mobile services below potential, and an overall underperforming sector. The government should identify necessary reform actions to effectively open up the market, adopt a unified sector policy, modernize the legal and regulatory framework, and re-empower the sector regulator.

77. **Urgently proceed with border management reforms.** Conclude the changes already set in motion, including the drafting and effective adoption of the new Customs law and the restructuring of the Customs administration into a "one head one body" organization. These changes in the governance of the border agencies are a critical prerequisite before any significant trade facilitation measure can be adopted and implemented. Without them, overlapping regulatory requirements, repetitive inspections by several different authorities, and the submission of redundant documentation will continue to be the opaque reality that traders have to face in their day-to-day operations at the PoB. Most importantly, lack of trade automation provisions will prevent the effectiveness of border management digital infrastructure and services. Despite, advice and technical assistance offered by the international community, the Lebanese Customs has repeatedly failed to implement these vital reforms.

78. **Institutionalize the digital port implementation process.** Establish a public-private data-collaboration policy framework to bring together currently siloed public and private sectors, establish trust within the port community, and enable identification of mutually accepted solutions. This will contribute to improvements in: (i) stakeholders' engagement, (ii) establishing data governance, (iii) orchestrating data, (iv) managing the change, and (v) enabling long-term financial sustainability. In order to achieve these goals, it is recommended that three committees are formed: the first at the inter-ministerial level, the second in the form of a steering committee or Port Community Council, and the third at a business process level. It is suggested that these are formed by a decision of the cabinet of ministers or by presidential decree, laying out the oversight mechanisms and decision-making responsibilities. The proposed structure is found in Annex 2.

79. **Incorporate digital provisions in the new Port Law.** The insertion of specific provisions in the new law will ensure that the port authority plays a leading role in the port digitalization process. The new port governance, based on the landlord model, is guided by business rules and good governance principles focusing not only on the management dimension of the port but also on tools and mechanisms for the provision of safe, secure, and reliable port operations facilitated by modern technology. The port authority is mandated to undertake a leading role in managing the port governance process, especially in the context of the steering and the business process committees. Also, within its responsibilities will be the design of a Smart Port Strategy, as an integral part of the national port strategy. This will allow the PoB to outline its strategic vision related to artificial intelligence (AI), Internet of Things (IoT), fifth generation technology (5G), digital twin blockchain solutions, and other smart technology-based methods.

80. **Streamline and standardize port operations and processes.** Port digitalization should only occur after the simplification, harmonization, and standardization of currently overlapping port business processes. Failing to do this will lead to the digitalization of inefficient and overlapping procedures, leading to limited impact on the ground. The undertaking of a Time Release Study (TRS), based on the WCO methodology, will assist not only in the measurement of cargo clearance times but will also allow the concurrent development of as-is and to-be business process maps at a granular level. The latter will enable the proper formulation of recommendations for the re-engineering of port processes and procedures.

81. **Embed optimized port processes into the new master plan.** Digitalization will also allow optimization of the port masterplan. Along with the obvious need for port reconstruction, Lebanese policymakers have a rare opportunity to redesign it around essential cargo flows and optimize the sizing and location of infrastructure and superstructure investments. Process streamlining and re-engineering, which is a pre-requisite for proper digitalization, will eliminate the risk of digitalizing duplicate and inefficient workflows. The new masterplan should be designed in a way to take into consideration the digital and the physical dimension of investments.

DESIGNING & IMPLEMENTING PORT DIGITAL SOLUTIONS
(DIGITAL PILLAR)

82. **Allow flexibility in the design of port digital structures**. The proposed architecture is based on lessons learnt from international best practices, as shown in Figure 6. The new digital port system should comprise three building blocks: (a) Lebanese MSW in compliance with the IMO FAL Convention; (b) PCS, enabling intelligent and secure information exchange between public and private stakeholders, with the first stage being its adoption at the PoB; and (c) NSW, enabling data collaboration between trade and border compliance agencies. It is recommended that the government undertakes the development of respective NSW, MSW, and PCS blueprints, which will allow the development of implementation roadmaps for each solution. Each roadmap will include broad-line implementation plans that cover (i) identification of prerequisites that need to be in place, (ii) functionality, scalability, and expandability, and (ii) technical requirements for implementation, maintenance, and customization.

83. **Secure interoperability and adopt technical standards.** The architectural design and functions of the above-mentioned structures should follow international agreement provisions and related standards, such as those included in the IMO Compendium, WCO Data Model, UN/EDIFACT, UN/CEFACT MMT RDM, and others as appropriate. The interoperability and coherence between the PCS, MSW, and NSW should be ensured to allow the maritime and trade logistics actors to benefit from the digitalization of these processes and associated applications.

84. **Reach an informed decision on the most appropriate financing model.** Port digital solutions for the PoB should be incorporated into the bigger financing package for the port reconstruction. In principle, port digital infrastructure may be implemented and operated either by (i) a Public Operator from a governmental agency or state-owned company, fully operated in house or subcontracted to a private firm under a management contract, (ii) a Public/Private Operator, with joint equity share, and Private Operator acting under a concession agreement, or (iii) a Private Operator acting under concession agreement. Option (i) regards digital infrastructure as a public service, while scenarios (ii) and (iii) assume a transaction fee and return on investment to be agreed by the government. A dire macroeconomic outlook and continuing economic crisis prevents Lebanon from selecting publicly financed digital solutions. Integrating port automated solutions into the broader port reconstruction package makes technical and financial sense.

Figure 6. Proposed Digital Pillar Action Plan for Lebanon
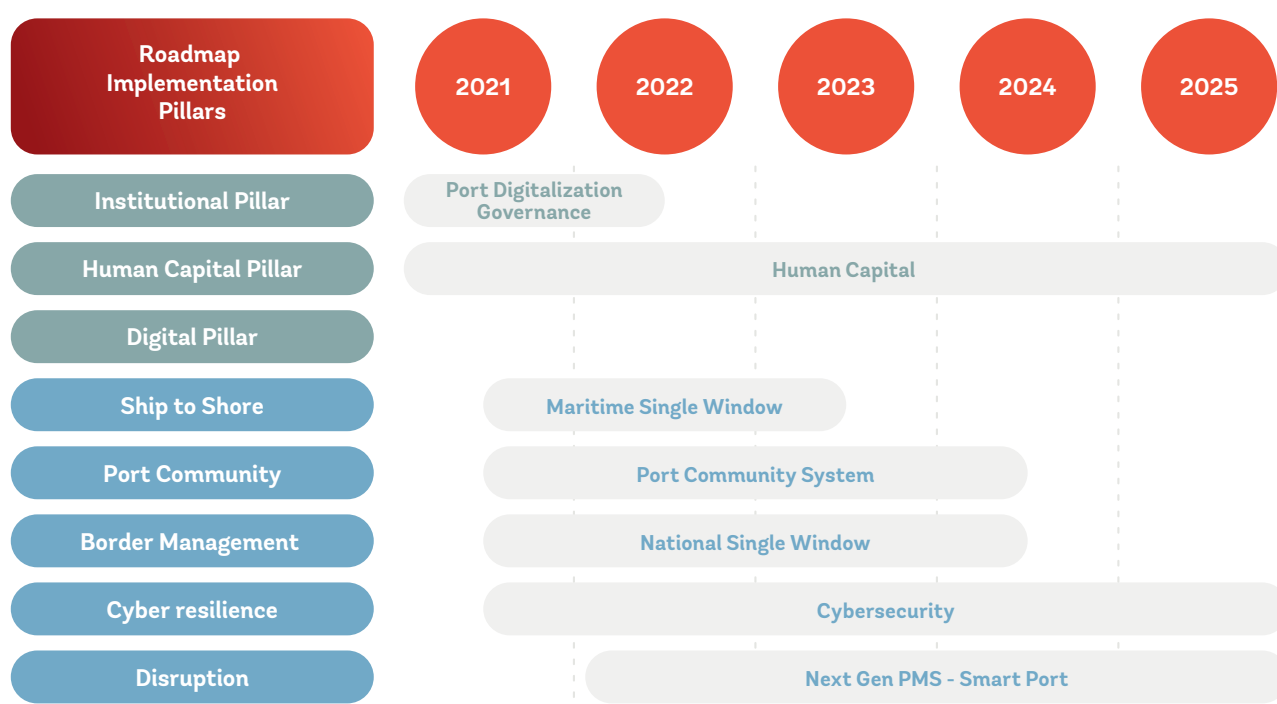
85. **Options to utilize private sector capital and know-how should be considered.** Core benefits of utilizing PPPs for the financing and operation of port digital solutions allows governments to: (a) reduce public sector's uncertainties related to short technological cycles and embedded difficulties of public agencies to keep up with cutting-edge solutions; (b) secure the interoperability of digital services via the implementation of projects with public-private coverage; and (c) undertake their regulatory responsibilities to secure public interests via enhanced cybersecurity and data confidentiality.

BUILDING HUMAN CAPACITY AND TECHNICAL SKILLS
(HUMAN CAPITAL PILLAR)

86. **Build human capacity for procurement purposes.** The final, but no less important, factor for successful and sustainable implementation of port digital solutions is the presence of strong Lebanese technical expertise both in the public and private sectors. Policymakers and regulators should have the knowledge and necessary skills to assess, beyond technical requirements, economic benefits, risks, and challenges, and understand the market, its requirements, and limitations. Public sector capacity constitutes a major issue especially in terms of digital infrastructure procurement under a PPP scheme. The Lebanese government should expect that international or domestic firms investing in the digital port project will use the best legal, financial, and technical support to protect their interests and should be able to negotiate on equal terms.

87. **Develop new skills for the new port digital era**. Respectively, the Lebanese private sector should present the necessary technical ICT and operational skills to be able to contribute to the project development either directly or indirectly and adjust to the new era of digital port and trade logistics. A comprehensive capacity-building plan should be developed by the government to increase the readiness of the country to enter the new digital era. This should include the training of thousands of users within public and private port communities in a data-collaboration platform, empowering people for data-driven decision making.

88. **Manage the implications of digital transition on port jobs.** Last but not least, a comprehensive assessment is needed to evaluate the impact of digitalization on current employment at the port and a contingent implementable plan for meaningful allocation of human resources based on existing or newly acquired skills and capabilities.

3.3 Way Forward

89. **The roadmaps for the transformation of the port sector in Lebanon have been charted, and it is now the responsibility of the Lebanese Government to launch the process.** The two papers published by the World Bank, the first on port institutional reform, and the present on port digitalization, in collaboration with AFD, spell out critical reforms that need to be engaged. Even though the limited mandate of the caretaker Government prevents engaging most of the needed reforms, most of the preparatory work for their implementation once the new Laws are adopted, and the engagement with all stakeholders – public and private – can, and should, be launched immediately to signal the international community the readiness of Lebanon to move forward in the reconstruction of the port.

90. **Digitalization of the port will happen under the pressure of the private operators and the public sector needs to manage the change to ensure a coherent development.** Rapidly evolving technology is creating the digital ports of the future and Lebanon should not be left out. Digital solutions will eventually enter the PoB either via capital investments of private operators and logistics companies or through public agencies' initiatives. The challenge of the Lebanese government is to manage the transformation process towards a structured and systematic technological upgrade of the port sector. By doing so, the risk of scattered, uncoordinated, and often overlapping digital initiatives will be mitigated. However, this requires the planning of an extensive capacity building and skills development program to increase Lebanon's readiness to enter the new digital era.

91. **Successful digital transformation is contingent to reform implementation.** Digital port solutions should not be narrowly perceived as a pure IT port infrastructure project. Beyond hard and soft digital infrastructure, there is an apparent need to develop the appropriate institutional and legislative framework in support of its seamless functioning. It full and effective adoption requires a set of fundamental reforms. Some of them, despite the fact that they have been identified a long time ago and characterized as urgent, are not implemented yet and have been stuck in the design phase for years. This paper offers a complete list of institutional, digital, and human capital reforms required to ensure successful operationalization. Out of these set of activities, the following four stand out as they have been extensively discussed and considered mature enough for swift implementation:

    i.   Re-activation of legal reforms in the Lebanese ICT sector.
    ii. Update and effective adoption the new Customs Law.
    iii. Restructuring of the Customs administration into a "one head one body" organization.
    iv. Incorporation of digital provisions in the new Port Law.

Enactment of the above-mentioned reforms will send signals of change and hope to the Lebanese people but will also comfort private port operators and the logistics industry players which plan to invest and operate in the Lebanese port sector.

Annex 1. Single Window Environment Key Benefits by Stakeholders

PORT AUTHORITY	• Trade facilitation • Vessel arrival, stay, and departure anticipation • Dangerous goods management • Infrastructure optimization • KPIs & business intelligence • Supply Chain security
CUSTOMS AUTHORITY	• Revenue Collection • Supply chain security • Coordinated border management with OGAs • Foundation for the development of a National Targeting Center • Pre-arrival risk assessment • Authorized Economic Operator • Pre-Clearance • Advanced cargo information • Cargo tracking and tracing • Compliance with national and international requirements
MARITIME AUTHORITY	• Trade facilitation • Port call anticipation • Advanced vessel, passenger, and cargo information • Dangerous goods management • Foundation for targeting and risk management system • Pre-arrival risk assessment
OTHER GOVERNMENTAL AGENCIES (OGAS)	• Trade facilitation • Coordinated border management • Surveys, inspection, and control of procedures • Availability of required data for control and inspection • Advanced Cargo Information • Pre-Clearance • Cargo tracing • Foundation for target and risk management system • Pre-arrival risk assessment

SHIPPING LINES	• Authorized Economic Operator • Port call optimization • Single submission of manifest • Security of cargo delivery • Decrease of recurring requests from third parties • Freight capacity & empty containers rotations improved • Empties management • Transshipment operations simplified
VESSELS AND PORT SERVICES OPERATORS	• Authorized Economic Operator • Port Call optimization • Port Security
TERMINAL OPERATORS	• Authorized Economic Operator • Just-in-time arrival of ship • Gate-in/gate-out authorization management • Resource optimization • Reduction of congestion and calls duration • Inventory accounting • Productivity increase
FREIGHT FORWARDERS	• Coordinated Border Management • Authorized Economic Operator • Tracking and tracing of cargo • Decrease of recurring requests from third parties • Reduction of staff physical movements • Security of import cargo delivery • Reliability of export cargo reception and loading • Ease of doing transfer under customs control
CUSTOMS BROKERS	• Coordinated Border Management • Authorized Economic Operator • Availability of logistics and commercial data • Data alignment • Decrease of physical movements • Anticipation of procedures • Leveraging transport time • Streamline customs procedures
CONTAINER FREIGHT STATIONS (CFS)	• Authorized Economic Operator • Acceleration of transfers • Stripping and stuffing • CFS gate-in/gate-out authorizations • CFS inventory accounting
INLAND CARRIERS	• Authorized Economic Operator • Decrease of waiting times • Removal of useless movements • Leveraging transport times • Loading list provision • PCS as a service

Annex 2. Institutionalizing Public-Private Data Collaboration

	INTER-MINISTERIAL COMMITTEE	STEERING COMMITTEE	BUSINESS PROCESS COMMITTEE
PARTICIPANTS	• Minister of Transport • Minister of Shipping or Maritime Affairs • Minister of Finance and Economy • Minister of Foreign Trade and Industries • Minister of Commerce • Minister of Health • Minister of Agriculture • Minister of Immigration • Minister of Homeland Security • Minister of Information Technology and Digital Economy or State Secretary for Digital Affairs	• Digital Ministry or State Secretary for Digital Affairs • Port Authority • Maritime Authority • Customs Authority • Foreign Trade Authority • Department of Immigration • Department of Health • Department of Agriculture • Department of Homeland Security • Terminal Operators Association • Shipping Lines and Agents Association • Freight Forwarder Association • Customs Brokers Association • Truckers Association • Rail Operators Association • Importers Association • Exporters Association • Insurance Association • Banking Association	• Port Authority • Maritime Authority • Customs Authority • Foreign Trade Authority • Department of Immigration • Department of Health • Department of Agriculture • Department of Homeland Security • Terminal Operators Association • Shipping Lines and Agents Association • Freight Forwarder Association • Customs Brokers Association • Truckers Association • Rail Operators Association • Importers Association • Exporters Association • Insurance Association • Banking Association
CHAIR	Prime Minister or President's Office	Port Authority	Port Authority
CO-CHAIR		Maritime Affairs and/or Customs and/or Foreign Trade	Maritime Affairs and/or Customs and/or Foreign Trade

	INTER-MINISTERIAL COMMITTEE	STEERING COMMITTEE	BUSINESS PROCESS COMMITTEE
TOPICS	• Champion the digital platform concept • Facilitate stakeholder cooperation • Supervise platform development • Drive policy reform and policy making • Review laws and regulations • Foster capacity building • Improve security • Promote the Fourth Industrial Revolution (4IR) • Drive innovation	• Review project status report • Follow up on milestones • Follow up on deliverables • Discuss risk management • Discuss change management • Review the legal framework • Improve security • Follow up on action items • Follow up on issues • Discuss outstanding problems • Discuss proposed actions to be taken • Resolve deviations from schedule • Take corrective actions	• 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 • Reengineer and reinvent all business processes as needed • Digitize all processes within port community • Introduce overtime and review new business procedures • Improve security • Imagine use cases for 4IR technologies • Foster best practices • Support in-change management activities related to implementation or introduction of new and reengineered processes within the port community • Implement standardization
FREQUENCY	Quarterly	Monthly	On request