UNITED NATIONS ECONOMIC COMMISSION FOR EUROPE

Trends for collaboration in international trade:

Building a common Single Window Environment

UNITED NATIONS

Trends for collaboration in international trade: Building a common Single Window Environment

by Somnuk Keretho, PhD, Kasetsart University, and
Markus Pikart, United Nations Economic Commission for Europe (UNECE)

UNECE would like to thank the following persons and organizations that have provided substantive input in the review of this paper and/or have contributed case studies:

Remy Marchand (AFNET), Frances Lopez (InterCommerce Network Services, Inc.),
The European Port Community System Association (EPCSA) through Richard Morton (Chair EPCSA), Tim McGrath (Vice Chair UN/CEFACT), Tom Butterly (UNECE), Jukka Savo (European Commission, DG Transport)

This paper was prepared under the
Joint United Nations Regional Commission Approach to Trade Facilitation
(UNECA, UNECE, UNECLAC, UNESCAP and UNESCWA)

United Nations
Geneva, 2013

Abstract

The Single Window concept has been implemented in many developing countries around the world as a major platform for collaboration and information exchange among different government agencies involved in international trade. However, in the global trade environment efficiency not only depends on well-functioning and coordinated government agencies but also on the full integration of trade and transport related procedures and information flows throughout the supply chain. Therefore, in addition to a Single Window platform that facilitates the regulatory procedures advanced economies have developed alternative concepts of highly specialised platforms to establish collaboration and information sharing between different stakeholders of the international supply chain. In the very short time of their existence, these inter-organization information exchange platforms have become crucial for the competitiveness of trade in the highly developed economies of Northern Europe and other advanced economies around the world.

This paper analyses the role of inter-organization collaboration platforms in global trade. It argues that the interoperability among different inter-organization information exchange systems in global supply chains will be the key success factor to future supply chain efficiency. The establishment of an environment that fosters the development of a network of inter-organization collaboration and information exchange systems is a responsibility of policy makers. Finally a draft policy framework is proposed to provide an environment in which different inter-organization information exchange and collaboration platforms can develop networks and synergies.

Table of Contents

Table of Figures

Executive Summary

Ten years ago UNECE summarized the Single Window concept in its Recommendation 33[1] as a concept to simplify border formalities by arranging a single (electronic) submission of information to fulfil cross-border regulatory requirements and to collaborate among the border agencies and trade community.

Today many developing countries have successfully implemented the Single Window concept to enhance collaboration of administrations involved in regulating cross-border trade and to adopt advanced information and communication technology to exchange information between the organizations.

However, advanced economies such as the European Union, has not adopted the concept of a fully centralized Single Window, probably because a centralized concept for all types of information flow and coordination is too restrictive to cover the many specialized needs of their highly developed supply chains. Instead a very diverse and advanced set of inter-organization information exchange and collaboration systems (IOSs) has emerged and many of these platforms are in rapid expansion.

These systems are used to manage specialized areas in cross border trade, such as maritime transport control, Port Community Systems (PCS)[2], Maritime Single Window[3] or Import and Export Control Systems (ICS/ECS)[4]. Many more of these systems are in preparation in specialized environments, focusing on specific geographic regions, supply chains, product groups, markets, customers or transport modes. Some are public, some are public-private partnerships and some are commercial operations. In fact a “Single Window” is often a specific example of such IOS, focusing particularly on the regulatory aspects of international trade or transport, as explained later in the paper.

All of these IOS systems are commonly planned and implemented independently of each other, driven by the initiative and interest of their stakeholders, the business processes and industry sectors. Over the last decade they have rapidly grown in number. Many of them have also seen significant internal growth, greatly increasing the stakeholder community and business processes they support.

However, as these IOSs evolve they are beginning to overlap in terms of stakeholders, business processes and information requirements. Today, every international trade transaction that touches a Northern European country is likely to invoke many different sets of these IOS systems. There is an increasing need to establish collaboration between the different IOS systems to provide a holistic view on the trade transaction and to deliver state-of-the-art services. Currently there is no common framework or best practice for this.[5]

---

1 UNECE Recommendation Number 33. http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf .

2 "How to Develop a Port Community System," European Port Community Systems Association, 2011.

3 "Guidelines for Setting up a Single Window System in Maritime Transport," International Maritime Organization, November 2011.

4 http://ec.europa.eu/ecip/help/faq/ens7_en.htm .

5 In the eProcurement domain the PEPPOL IOS developed by the European Commission that could provide guidance for how interoperability between the various IOSs in the single window environment could be developed without comprising their internal integrity.

Establishment of an environment that fosters the interoperability between these different collaborative platforms is a strategic objective that is in the interest of all the trading nations. Consequently, it is a key responsibility of policymakers to create a supportive environment in which the stakeholders of the IOS systems can establish collaboration and synergies between their systems.

This paper suggests leveraging synergy effects by enabling interoperability among different inter-organization information exchange systems (IOSs) along international supply chains. For example in the European context, the EU e-Freight, Port Community Systems, EU eMaritime platforms, IMO e-Navigation, EU eCustoms and the Computerized Transit System constitute different networks of stakeholders enabling new and high value services for European governments, traders and society at large. In establishing a framework for interoperability between these individual networks a "network of networks" could be established, allowing the exchange of information and development of higher integrated services and solutions.[6]

The paper firstly suggests that the original concept of Single Window and ICT applications for trade facilitation needs to be expanded into a broader but more integrated supply chain concept. This should cover not only border formalities and regulations but also commercial, financial, and transport-related processes.

Secondly, collaboration among different groups of stakeholders and interoperability among the inter-organization information systems is the key success factor to overcome the multifaceted processes and challenges of trade facilitation, thereby enabling the full potential of ICT for the whole of the supply-chain transactions.[7]

Thirdly, based on several national and regional interoperability frameworks[8,9], a global interoperability framework for international supply chain connectivity is proposed in this paper. This should enable the interoperability among different inter-organization information exchange platforms and to guide the future development of a global network of networks of collaboration.

We have analysed the latest trends and evolutions in cross-border supply-chain management in the European Union and in many other countries around the world, and believe that the concepts we propose are also highly relevant for emerging and developing economies. As their economies develop, their supply chains will diversify and increase in complexity. This leads to the emergence of IOS systems in developing countries as well and in turn the need for concepts of collaboration between the systems. For example, several economies in Asia and Africa have now started to discuss interoperability between their Port Community System (PCS) and their Customs Clearance System or their Single Window systems.

6 Such topologies are sometimes referred to as 4-corner models in that they allow stakeholders to participate via independent services and service providers. It is these services and service providers who provide the interoperability. The Internet and World Wide Web operate using 4-corner models for services.

7 Suitable governance models need to be established to achieve this collaboration. An example of such is ISP/PRF TS 17187. "Intelligent transport systems – Electronic information exchange to facilitate the movement of freight and its intermodal transfer – Governance rules to sustain electronic information exchange methods."

8 "e-Government Interoperability: a comparative studies of 30 countries," CS Transform, 2011.

9 "Interoperability in the e-Government Context," by Marc Novakouski and Grace A. Lewis, Carnegie Mellon University, January 2012.

1. Introduction

In the world of globalization, making trade across borders as simple, efficient and safe as possible is essential for traders, concerned public authorities and governments. The complexity of cross-border trade and the number of parties involved greatly increase the co-ordinated requirements of information for facilitating and controlling the movement of goods. Despite the advancements of information and communication technology (ICT), most information exchange between the different parties of international supply chain is still largely paper-based using unstructured data. The full potential for improving collaboration among stakeholders by using shared information across the whole supply chain is still a goal that has not been reached yet.

Section 2 of this paper examines the Single Window concept as it applies to regulatory services and the way it has been adopted in many economies. A Single Window is a collaborative platform where trade-related information and documents need only be submitted once at a single entry point to fulfil all import, export, and transit-related **regulatory requirements.** There are evidences showing that the implementation of regulatory Single Windows worldwide has been extensive in developing economies (less so in developed economies) but with different objectives, models and approaches being adopted.

This section highlights several observations and challenges in establishing such a Single Window facility which are the basis for our proposed future directions.

Section 2.1 notes that the Single Window initiative is highly instrumental in providing a platform for collaboration and information exchange between government agencies and business communities involved in cross border trade. Since the Single Window implementation aims to mainly improve regulatory processes, several authorities and regulatory agencies are needed to be actively involved.

Section 2.2 argues that governance and management of collaboration among many regulatory agencies is one of the key challenges to successfully implement the Single Window concept. However, because of the complexity and potentially large number of relevant government agencies in developing a SW, most economies do not integrate "ALL" government agencies involved in import, export and transit operations in their SW. Instead most countries are content to create a network of some selected government agencies and consider this network to be their "Single Window."

Section 2.3 discusses that the difficulties in establishing a SW facility lie mainly in inter-organization coordination among several regulatory agencies, trade and transport communities. Most economies establish the Single Window in a phased approach by linking smaller networks such as e-Customs and other government agency networks. In this case, a Single Window can be regarded as a bridge or gateway into a "Network of Networks".

Section 2.4 observes that two main types of regulatory Single Window networks are generally established namely trade-related Single Window and transport-related Single Window. Ideally, one single window should cater for both. However, as observed from many economies, we argue that it is most likely that these two types of networks are established separately because of the sheer complexity of collaboration between the various different types of stakeholders and their specific priorities. Nevertheless, there is need for these networks to interconnect and interoperate since some of the processes and

information flow overlap and better coordination and synergy along the whole supply chain can be further leveraged.

Within Section 2 we argue that Single Window can be considered as a special type of inter-organization information system (IOS) which focuses on regulatory requirements for cross border trade. This approach simplifies the integration of SW and other collaborative platforms such as Port Community Systems (PCS) or eFreight by using the same framework, standards and recommendations.

Section 3 of the paper observes that these separate IOSs are normally built in isolation. However, as more and more IOSs evolve in an economy, they come closer to other IOSs in terms of overlapping stakeholders, data, processes and legal context. Thus, there is an increased need for networking between IOSs to create synergy and interoperability among these IOSs. This section proposes, therefore, that these different SWs and different IOS systems within an economy and also between economies need to be interconnected and interoperated for more efficient, secure and effective operations.

Section 4 proposes a model to cluster international trade transactions into groups of closely-related processes. Each group contains related stakeholders and business processes which provide a natural environment to establish a platform of collaboration between stakeholders. The model helps us to understand and structure the IOS systems that are emerging in the economy and to understand the needs for interoperability and the types of interaction among them.

Section 5 purposes a global interoperability framework. Managers of IOS systems can use this framework to negotiate collaboration between different IOS systems. This will lead to the integration and collaboration along the international supply chain.

The conclusions and recommendations are provided in Section 6.

2. Assessment of the Single Window concept and its implementation

It is now almost ten years since UNECE through its Centre for Trade Facilitation and Electronic Business (UN/CEFACT)[10] published "Recommendation 33 - Recommendation and Guidelines on Establishing a Single Window to enhance the efficient exchange of information between trade and government". In this recommendation, the Single Window is defined as a "facility that allows parties involved in trade and transport to lodge standardized trade-related information and/or documents to be submitted once at a single entry point to fulfil all import, export, and transit-related regulatory requirements."

Since that time, many Single Windows have been implemented worldwide with different models and approaches being adopted. Many economies report that Single Window is a major catalyst for trade facilitation which has brought considerable economic benefits to the economy[11].

According to the World Bank's trading across border study conducted in 2012, out of the 185 economies surveyed, 71 economies have implemented Single Window systems[12]. These Single Window platforms support electronic services with varying complexity. In general, these facilities allow electronic filing, transferring, processing and exchanging customs and other regulatory information, and link not only traders and customs but also other regulatory agencies involved in trade and transport through an electronic single-window system.

Practice	Economies	Examples
Allowing electronic submission and processing	149[e]	Belize; Chile; Estonia; Pakistan; Turkey
Using risk-based inspections	133	Morocco; Nigeria; Palau; Vietnam
Providing a single window	71[f]	Colombia; Ghana; Republic of Korea; Singapore

Figure 1 - Electronic systems for trade across borders[13]

We notice that most of Single Window systems are gradually implemented by providing electronic Customs declaration and clearance systems, and then connecting electronic Customs systems to a few selected regulatory agencies. For example, Colombia and Senegal have both implemented single window systems, though they still lack support for the complete set of regulatory processes. El Salvador set up a Single Window linking Customs and some other government ministries including tax and social security authorities.

[10] Published in 2005, http://www.unece.org/fileadmin/DAM/cefact/recommendations/rec33/rec33_trd352e.pdf, UN/CEFACT later developed UNECE Recommendations 34 and 35 on Data Harmonization and the Legal Framework for Single Windows, respectively.

[11] http://www.doingbusiness.org/~/media/GIAWB/Doing%20Business/Documents/Annual-Reports/English/DB13-Chapters/Trading-across-borders.pdf

[12] http://www.doingbusiness.org/data/exploretopics/trading-across-borders/good%20practices#sub-menu-item-link (as data collected by June 2012).

[13] "Trading Across Borders report 2012," World Bank, 2013. http://www.doingbusiness.org/data/exploretopics/trading-across-borders/good%20practices#sub-menu-item-link

Many economies have reported positive results from the implementation of single window systems in terms of time, cost, transparency and compliance. For example, cross border trade in El Salvador has been simplified as the number of documents traders need to submit has been reduced and information available in electronic forms can be crosschecked for better compliance among the regulatory agencies involved. In the case of Thailand it is estimated[14] that trade transaction cost savings achieved through the National Single Window implementation reached $1.5 USD billion annually, even though the full platform and all envisioned connectivity have not yet been implemented.

However, the Single Windows implemented by many countries do not strictly follow the definition of the Single Window facility as set out in UNECE Recommendation 33. Depending on their readiness and priorities, economies have implemented very different forms of Single Windows ranging from integrated Customs solutions to sophisticated Port Community Systems and regional platforms. The Single Windows that countries implemented were general large interagency collaborative systems that facilitate and automate business processes and data exchange for international trade. This observation was also discussed in the UN conference and the discussion paper on *Ten Years of Single Window Implementation*[15].

An Inter-Organization Information Systems (IOS) for international trade is defined as a collaborative and information exchange platform to facilitate the interaction and coordination of a group of stakeholders along the international supply chain. Specific IOSs allow the information providers to lodge standardized information and/or documents related to the specific area of trade covered by the IOS to fulfil the relevant commercial, transport or regulatory requirements. A “Single Window” or a Port Community System are examples of such systems.

The fundamental thesis of this paper is that all such trade related IOSs should be linked together through a common framework agreement to allow interoperability and reduce the need for resubmission of similar information to individual IOISs, encourage date sharing and process simplification, and thus ensure greater trade efficiency.

Some observations and challenges in establishing such a Single Window facility are summarized in the following subsections. These observations will provide some context for our further discussion and recommendations in the subsequent sections.

2.1. Single Window as a platform of collaboration between government agencies and business stakeholders

As described in the discussion paper on ten-years lessons learned of Single Window implementation, UNECE Recommendation 33 was highly instrumental in changing the way information was handled among government agencies, as it specifically stated that "a Single Window should represent a close cooperation between all involved governmental authorities, and trading community."

[14] Based on the World Bank's trading across border indicators during 2007-2012, referring to the UNNExT Brief n°08, August 2012, "Developing a National Single Window for import, export and logistics in Thailand."

[15] "Ten Years of Single Window Implementation: Lessons Learned for Future" by Jonathan Koh, prepared for the UNECE Global Trade Facilitation Conference in December 2011.

This idea challenged the conventional silo approach of regulatory control for the movement of goods by proposing a more integrated and collaborative approach among several regulatory agencies.

Establishing collaboration among different government authorities and creating trust and cooperation between those agencies and the business community can be a daunting task. The main challenge is that there are so many different authorities and agencies, with each holding legislative power and control on various regulatory levels. Each agency has a different mandate and focus on the issues related to trade, transport logistics, customs control, health, border control, plant and animal quarantine, sanitary and phyto-sanitary, food and drug safety, maritime and defence, environmental and consumer protection among many others.

As a consequence, policy makers and implementers of the Single Windows often found themselves pioneering the creation of the "connected electronic government" framework[16], because there had been no such large and complicated endeavour in the country before. Few, if any, e-Government initiatives have as wide a scope and breadth as a Single Window project, which generally requires interoperability between many government backend systems, each operating as an independent organizational information management system. The interconnection between these systems and collaboration of their agencies define the unique challenge of the Single Window project.

In summary a Single Window provides a new platform for collaboration and information exchange between government agencies and the business community involved in cross border trade. A Single Window is a highly integrated inter-organization information exchange system with the purpose to simplify and automate regulatory-related procedures in international trade.

2.2. Typically, a Single Window connects only a small number of government agencies

Because the complexity and the large number of agencies involved, it is rare to find an operational Single Window facility covering all government agencies involved in cross-border trade and transport transactions. In a typical economy, between 20 and 40 of government authorities and agencies are involved in the regulation of cross border trade. A survey of 58 economies having various levels of electronic Single Windows showed that in reality Single Windows connected only a small number of these agencies[17].On average only three agencies were connected through the national Single Window.

Many implementers found that the challenge of coordinating different agencies, each with their own procedural and information requirements, into one simplified coherent approach was often more a political than technical challenge.

[16] The concept of "connected" government is derived from the whole-of-government approach which is increasingly looking towards technology as a strategic tool and as an enabler for public service innovation and productivity growth - United Nations e-Government Survey 2008 - From e-Government to Connected Governance.

[17] Only three regulatory agencies on average of 58 economies, based on a WCO Research Paper No.17, "A Survey of Single Window Implementation," Jae Young Choi, August 2011 (page 6).

Success depends upon 1) the willingness and readiness of the agencies and the private sector stakeholders to collaborate, and 2) the complexity of the regulatory framework.

In conclusion, we note that few regulatory Single Window system have connected to all government agencies and authorities involved in cross border trade. Existing regulatory Single Windows are effectively inter-organizational information systems focused on specific regulatory tasks, geographic locations or logistics processes. This observation and its implication will be discussed further in the following subsections.

2.3. Interagency Information Systems as incubators

Establishing a Single Window is a daunting task which normally takes several years for initiation, planning, implementation and change adoption. There are many challenges in Single Window implementation making it a long journey to successfully turn its vision to reality.

As mentioned earlier, the difficulty in establishing the SW facility is mainly in inter-agency coordination among several government departments, regulatory agencies and business stakeholders while each with their own requirements, priorities and different levels of readiness. Other challenges for single window implementation involve policy planning, business process re-design, document simplification, common data definitions and formats, legal arrangements, change management, budget and human resource preparation, and project management.

According to a WCO survey[18] and as seen in many other cases, single window systems have been developed on a "phased approach," and most of them are still in the process of development as the scope of single window functions continues to expand. While a Single Window is implemented in several phases[19], each phase covers a specific group of government agencies. The first group is usually selected based on their strategic importance, clearly identifiable scope or objective, their readiness for change and their willingness to simplify their related cross-border trade processes. The same survey also found the number of documents as well as the number of agencies electronically connected is increasing as the SW matures.

Most Single Windows start out as an e-Customs system, linking Customs with exporters and importers, customs agents and logistics operators. In other words, they start as a small and focussed IOS. The level of complexity and the number of stakeholders that are linked in this IOS vary significantly from one economy to another. However in each case the primary stakeholders and drivers are public sector bodies. In a second step economies may create another interagency information system. For example, many developing economies implement electronic transactions related to issuance and use of certificates of origin, phyto-sanitary/sanitary and health-related permits and certificates. This is mainly driven by the needs and political mandates to facilitate many bi-lateral and multi-lateral trade agreements and also to meet food safety concerns. Thus, given a phased

[18] WCO Research Paper No.17, "A Survey of Single Window Implementation," August 2011.

[19] Phased development is also discussed in the "UNNExT Single Window Planning and Implementation Guide" UNESCAP/UNECE, 2012.

implementation approach a Single Window can be described as a set of slowly emerging IOS that are linked under a common technical and inter-organizational platform.

In conclusion, we argue that a regulatory Single Window platform, as a network of collaboration, is normally established in a phased development approach by developing and linking smaller networks such as e-Customs and other government agency networks. Over the time this collaboration establishes a dynamic pattern of emerging trade and logistics networks on the national level that are connected through the national Single Window network. Thus a Single Window can be regarded as an IOS focussed on regulatory procedures for cross border trade that establishes further links between other existing public and private sector IOSs that have a more specific scope.

The following subsection examines another important collaborative scenario. It is a more-likely situation of collaboration between different sets of regulatory agencies.

2.4. Port Community Systems providing integrated business operations environments to user communities in Europe[20]

Role of Port Community Systems

Port Community Systems (PCS) in Europe have a major role in the management of business operations in Port and Airports. A PCS is an electronic platform that connects the multiple systems operated by a variety of organisations that make up a seaport or airport community. It is shared in the sense that it is set up, organised and used by firms in the same sector – in this case, a port community.

A good collaboration between all the parties involved is one of the key success factors of a PCS. Distinctive for all PCSs is the link to Customs and port authorities and other institutions such as veterinary offices or coastguard, for example.

PCSs in Europe have a long tradition. The first PCSs in Germany, France and UK began to operate in the late70s or early 80s. Countries such as the Netherlands and Spain started their PCSs in the 1990s or at the turn of the century. Some PCS are 100% publicly owned; some are private-public partnerships; others are privately owned.

Key drivers for the establishment of Port Community Systems were, on the one hand, the need for a standardised communication platform in order to improve the systems in terms of punctuality, reliability or costs and, on the other hand, the need to increase competitive position among ports.

A good collaboration with the key authorities, as well as with stakeholders, potential customers and local trade associations, was critical in the setting up of the respective PCS which were – and still are – implemented by means of special training and workshops with the end users.

[20] Information in this chapter was provided by the European Port Community Systems Association (EPCSA), *www.**epcsa**.eu/*

The number of ports connected to a PCS varies from one to 20. Smaller ports in particular often join forces to set up a PCS or connect to an already existing PCS of a larger port or airports.

Port Community System definition, a Port Community System:

- is 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
- optimises, manages and automates port and logistics processes through a single submission of data and connecting transport and logistics chains

The Port Community System Provider

Port Community Systems are operated by a service provider. For most of the European PCS providers, the operation of the PCS represents their core business. However, almost all PCS providers are involved in other IT and consultancy projects for the logistics industry. Every PCS has some form of steering committee made up of representatives from different internal and external groups, such as the board of directors or local user groups.

The range of PCS key stakeholders consists of private companies on the one hand (shipping agents, terminal operators, forwarders, Customs brokers, etc.) and of public or government agencies – Customs or Port Authorities, for example – on the other hand.

In terms of the client structure, shipping lines and freight forwarders play the most important role, followed by importers and exporters in general or Customs and shipping agents. The number of clients differs and ranges from about 280 to 2,000, with most of them being importers or exporters, forwarders, terminals, on-carriage operators, ship agencies or brokers.

The number of end users ranges from about 500 to more than 7,500 but this does not seem to be related to the size of the PCS or to how many PCSs are being operated.

Services provided through the Port Community System

A PCS is a modular system with functionality designed to provide all the various sectors and players within a port community environment with tools specific to them, thus delivering a tightly integrated system. Developed for port users by port users, a PCS encompasses exports, imports, transhipments, consolidations, hazardous cargo and maritime statistics reporting.

PCSs in general provide a wide range of services and key features which can be summarised as follows:

- Easy, fast and efficient EDI information exchange, re-use and centralisation, available 24/7/365;
- Customs declarations;

- Electronic handling of all information regarding import and export of containerised, general and bulk cargo;
- Status information and control, tracking and tracing through the whole logistics chain;
- Processing of dangerous goods;
- Processing of maritime and other statistics.

The core benefits for all parties involved are higher efficiency and speed regarding port processes, particularly through automation and the reduction of paperwork. In this way, PCSs contribute to sustainable transport logistics and support the ambitions to meet global carbon reduction requirements.

The functionality is aimed at eliminating unnecessary paperwork which can clog up cargo handling. Using electronic data exchange, the PCS is an effective real-time information system; fast, focused, flexible and multi-faceted, it aims to improve efficiency at all stages of the process of manifesting, through vessel discharge and loading, Customs clearance, port health formalities and delivery in and out of the terminal.

As well as the above, the PCS offers improved security, cost reduction and potentially more competitiveness for each user. Port Community Systems can also act as Gateways or clearing centres to National Single Window. In the business processes of port logistics, the PCS are well established, which means that they already have active interfaces with most of the carriers, terminals and local authorities. Facilitating trade by linking regulatory business processes with operational business processes

In order to achieve efficient Trade Facilitation it is critical to have minimal and simplified reporting procedures for regulatory purposes such as Customs, veterinary inspections and maritime reporting requirements. However, even the quickest and most effective regulatory procedures will fail to produce improved Trade Facilitation if operational requirements are forgotten.

Operational requirements including cargo discharge, location on key and status of goods. If, as an example a container is cleared by all authorities and the shipping line, forwarder, haulier have not been advised then the container will sit on the quayside until the confirmation of release is given to the Port.

A Port Community System provides links between the regulatory and operational aspects of the supply chain through informing all stakeholders for each consignment the current status of the goods thus ensuring once cargo is authorised to be released all the relevant parties are informed and as such the cargo is free to move.

2.5. Two main types of Single Windows and interoperability needed

From SW implementation in many economies, we can observe two main types of Single Windows, namely Trade-related Single Window and Transport-related Single Window[21].

Trade-related Single Window

Most existing Single Window implementations in developing and emerging economies provide electronic services for trade related regulations e.g. customs clearance of cargos, and import or export permits and licenses to support high priority policy agendas such as revenue collection, protection of public health and safety and implementation of trade agreements. The focus here is on the goods being traded.

Referring to a UNESCAP survey[22], most National Single Windows in Asia and the Pacific provide only trade- and cargo-related[23] functions and services, e.g. electronic application and issuance of trade licenses, electronic submission of sea cargo manifests, electronic submission of air cargo manifests, electronic submission of customs declarations, electronic application and issuance of preferential certificate of origin, electronic application and issuance of import/export permits and certificates for different types of goods, e-payment of customs duties and fees, electronic applications for customs refunds, and electronic reconciliation of manifests/declaration.

Trade-related SWs have a focus on goods being traded or cargos handled with the goods being carried by a ship, aircraft or other means of transport.

Note also that the original UNECE definition of a Single Window is mostly related to the trade and cargo type.

Transport Operations-related Single Window

The other aspect of regulatory single windows deals with the physical operations required to move the goods. Few economies have established Single Window facilities to support regulations for transport. For example, in maritime transport, the FAL convention[24] and the FAL Compendium define the information that is required before a ship can go to berth. There are many stakeholders and agencies involved in regulatory maritime transport, e.g. the maritime authority, sea safety and traffic controllers, vessel piloting officers, towage and mooring services, the port authority, vessel agents and vessel operators. All these agencies and stakeholders need to work collaboratively, and electronic messages and exchange can facilitate this. Transport-related Single Windows can provide collaboration and information exchange services for these stakeholders.

---

21 This observation was thoroughly discussed in "Guidelines for Setting up a Single Window System for Maritime Transport," International Maritime Organization, November 2011.

22 Results from an Expert Survey conducted by UNESCAP on Trade Facilitation and Paperless Trade in Asia during the APTFF Forum, Sri Lanka, October 2012 (reported in February 2013).

23 A "cargo" normally refers to goods or merchandise carried by a ship, airplane or other vehicle.

24 The FAL Convention (FAL - IMO: Facilitation Committee) was adopted in 1965 and has been amended a number of times since then (http://www.imo.org/OurWork/Facilitation/ConventionsCodesGuidelines/Pages/Default.aspx).

We note that there are a substantial amount of literatures available on trade-related Single Window. Transport-related SW is less extensively covered in the literatures[25]. Only recently, the International Maritime Organization (IMO) provides some guidelines for setting up a Single Window system for maritime transport[26]. These guidelines, i.e. as developed by IMO, provide some good guidance on how to establish single window platforms for maritime transport clearance, including the clearance of the ship.

The trade and transport IOSs are usually developed as independent systems. Electronic services of transport-related facilities tend to be separate from their trade-related facilities even though they ultimately support the same export or import transaction.

The ASEAN Single Window Environment

Background

The 10 member nations of the Association of Southeast Asian Nations (ASEAN) have set an ambitious goal of establishing the national-wide single window platform in each of the member country. These ten national single windows will later be interconnected and interoperated to create a regional integrated trade platform called "ASEAN Single Window environment."

Scope of the ASEAN Single Window

Most national Single Windows in ASEAN members are trade related Single Windows, extending their functions from the electronic Customs clearance system to other government agencies mainly for trade and cargo-regulatory procedures. In the past years, few ASEAN member countries[27] provided full electronic functions related to transport clearance and transportation-related services, e.g. PortNet of Singapore, and PKCS[28] of Malaysia. Now major transport related IOSs are emerging in ASEAN region, for example the Port Community Systems in Indonesia. Policy makers in several ASEAN member countries are not aware of the need to interconnect the national Single Window with the maritime department, the port authority and other transport-related stakeholders. Consequently the ASEAN Single window plan of actions lacks activities to link ASEAN Single Windows with the emerging transport related IOS systems of the region.

[25] However, there are some good literatures and much work related to land-based transits and electronic information platforms.

[26] "Guidelines for Setting Up a Single Window System for Maritime Transport," International Maritime Organization, November 2011.

[27] "ASEAN Single Window - Hearing Survey," JASTPRO, December 2012.

[28] Port Klang Community System, http://www.unescap.org/tid/projects/swsl-s2-chandra.pdf .

The development of Single Window and IOS in European Union Member States for ship related reporting

Background

The European Union is determined that reporting formalities required for the clearance of ships and cargo in ports need to be simplified and harmonized to the greatest extent possible.

Many of the current processes in the maritime transport sector, even if electronic, are still based on those established for paper decades ago. Vast amount of information is constantly collected and stored within the maritime transport domain. Existence of this information should be acknowledged and benefits reaped by using this information in order to remove unnecessary reporting obligations and optimising port processes.

The EU e-Maritime initiative aims at optimisation of ship and cargo related port processes and reduction of administrative burden by looking into current business processes and regulations and proposing facilitations with the help of modern ICT technologies and by removing obsolete practices and regulations.

Reporting Formalities

One of the initiatives which has been taken in this regard was the adoption of Directive 2010/65/EU on Reporting Formalities for ships[29]. The scope of this Directive is to simplify and harmonize the administrative procedures applied to maritime transport by making the electronic transmission of information standard and by rationalizing reporting formalities.

This Directive applies to the reporting formalities applicable for ships arriving in and departing from ports situated in the 23 EU maritime Member States. These 14 formalities derived from the EU legislation and from the international agreements within the International Maritime Organisation.

National maritime Single Windows

The Directive requires that the EU Member States will have to accept the fulfilment of reporting formalities in electronic format and their transmission via National Single Window by 1 June 2015. After this date paper submissions can no longer be accepted. The information should be submitted only once and made available to all relevant authorities within a Member State and between the Member States.

In order to facilitate the submission of data in different EU Member States, the Single Windows will introduce user interfaces and data sets harmonised on the EU level. The Member States can develop their own system architectures and specifications, or draw benefits from those modules developed within the European Commission initiatives.

To maximize the benefits, the single windows will be linked to information systems which have already been established within the EU, such as the SafeSeaNet system and the eCustoms. This will ensure that the shipping industry will be able to transmit standardized information whereby individual data elements are reported only once.

[29] http://eur-lex.europa.eu/LexUriServ/LexUriServ.do?uri=OJ:L:2010:283:0001:0010:EN:PDF

To further reduce the administrative burden for maritime transport, the EU SafeSeaNet system is used to receive and distribute relevant information between the EU Member States.

All relevant national authorities, such as transport, customs, health, border control, port security, ship safety and environment, as well as industry, are participating to implementation work.

Blue Belt

The Blue Belt[30] is a concept according to which ships can operate freely within the EU internal market with a minimum of administrative burden and in which safety, environmental protection as well as customs and tax revenues are ensured by an optimal use of existing capabilities to monitor maritime transport and the cargo concerned.

Territorial waters are considered as the EU's external borders. So technically, vessels travelling between EU ports are leaving the EU Customs Territory. As a result, customs clearance is required when the vessel leaves the port of departure and again when the vessel arrives at the port of destination, unless the vessel is travelling under a Regular Shipping Service (RSS) scheme.

Looking at vessels carrying both EU and non-EU goods and calling also at non-EU ports, a so-called eManifest, an electronic harmonised cargo document would allow for facilitation and speeding up of customs procedures for EU cargo by enabling customs to distinguish between Union and non-Union goods. Currently, all goods arriving in EU ports are considered to be non-Union goods, even if they come from a previous EU port without having called in a 3rd country port. The European Commission is currently working together with the Member States and the industry in order to set the specifications for the eManifest. The eManifest should be ready to be applied as of June 2015 with the establishment of the National Single Windows as foreseen in the Reporting Formalities Directive.

SafeSeaNet

SafeSeaNet was established by the EU as a centralised European platform for maritime data exchange. It enables European Union Member States, Norway and Iceland, to provide and receive information on ships, ship movements, and hazardous cargoes. Main sources of information include Automatic Identification System (AIS) based position reports, and notification messages sent by designated authorities in participating countries. With its capacity to track vessels it provides important service for e-Maritime facilitation environment by pinpointing the position of vessels and cargo moving on sea and therefore supporting the port operations with the help of PCSs and cargo tracking and management through the logistic chain within the e-Freight initiative. Starting from 2015, SafeSeaNet will be also providing a platform to exchange data between the Reporting Formalities National Single Windows.

[30] http://ec.europa.eu/transport/modes/maritime/news/bluebelt_en.htm

As seen in the examples of the ASEAN trade Single Window and the EU eMaritime SW, trade and transport related Single Windows has been developing from the different needs. Most SW platforms emerge from a Customs automation system[31]. It is a natural evolution to integrate permits, certificates and licenses related to goods as issued by other regulatory agencies for international trade. This leads to the evolution of trade-related SW.

On the other hand, maritime transportation is under the regulatory control of various different departments such as transport authorities, border control and customs. Therefore it is quite natural for one of these agencies to take the lead and integrate other agencies for transport-related regulations into an IOS. This leads to the evolution of transport-related SW, for example, Maritime SW.

Obviously the interoperability between transport and trade related IOS would be more easily achieved if both were developed in a single, centralized effort. However, such an approach is likely to fail due to the complexity of such approach. Each of the different systems involves numerous agencies and stakeholders with different ambitions, needs, mandates, financing structures, priorities and readiness. The separate development of two (or sometimes more) inter-organization platforms allows the individual collaborative platforms to adapt to the different needs, exploit opportunities and avoid deadlocks relative to their own community. It is politically (and perhaps commercially) necessary for these platforms to remain autonomous in their internal operation. However, as can be seen from the European Single Window development, they also need to interoperate with other autonomous platforms and development might even lead to closely interlinked systems which require common sets of rules for information sharing.

As it is often the case in open, market driven economies, a decentralised and user-driven approach can be more flexible and efficient than a centralized planning. Consequently we see that in most countries, the collaborative platforms for trade and the transport are separately implemented. However, it is also true that large transnational initiatives will need to have a strong central policy support and coordination in order to tackle possible cultural, technical or legal barriers. Nevertheless, because of the overlapping processes and stakeholders there is a growing need for these networks to interconnect[32]. This can be viewed as a need to “connect the islands of IOSs”.

We conclude in this subsection that they are two main types of SWs which can be found in an economy, Trade-related SW and transport-related SW. These two IOSs are established separately by different stakeholders and can evolve independently. Both systems ultimately support the same trade transactions. Eventually these platforms must be interconnected and interoperated to leverage synergy and better coordination along the whole supply chain. The need of interoperability between these two types of electronic information exchange platforms will be discussed in more detail in Section 3.

[31] According to a recent survey by UNESCAP, the inter-agency national single windows typically evolve from Customs automation systems.

[32] "Three Dimensions of Organizational Interoperability", Herbert Kubicek and Ralf Cimander, European Journal of ePractice, January 2009.

3. The need for interoperability between different inter-organization information systems

We emphasize that the proposed framework for interoperability in this paper is not just about interoperability between different agencies (this is the function of individual SWs and IOS as previously discussed). Rather, this paper discusses how to further progress and establish interoperability between individual SW facilities (different IOS platforms), both within a country and between countries. This interoperability would create a **network of inter-organization information exchange platforms** along the international supply chain.

Building a network of IOS for a Single Window Environment in the Philippines by Frances Lopez[33]

In the Philippines, the authorities[34] governing the economic zones and free port zones implemented their respective electronic import permit systems before the National Single Window (NSW) got underway. From a 2-3 day permit processing cycle time following manual procedures, the online import permit systems which are available on 24/7, dramatically reduced the cycle time to less than two (2) minutes. Although the economic zone authority was selected as one of the agencies to pilot the implementation of the NSW in 2006, it was agreed that the electronic import permit system be maintained by the economic zone authority and with the approved import permit data transmitted automatically to the NSW upon permit approval.

The Department of Agriculture[35] embarked on the harmonization of the import procedures in 2002, and embarked on the automation of its procedures of its agencies issuing permits for agricultural products, i.e., animals, fisheries and plant commodities and products. Three agencies[36] of the Department were likewise selected as pilot agencies for the NSW, and while participating in the initial implementation of the NSW, the agencies piloted the implementation of Department of Agriculture Trade System (DA Trade System) in 2009, automating the Sanitary and Phytosanitary Import Clearance (import permits) processes. Subsequently, other processes including e-Certificates, quarantine inspection and the mandatory second border inspection processes were added to the design and implementation of the DA Trade System. While the DA Trade System is being developed and maintained as an independent IOS for regulation of agricultural products in the Philippines, it has established a data interchange with the Philippine National Single Window System allowing exchange of the approved import permit data from DA Trade System to the NSW.

Further, on-going discussions on the exchange of e-Certificates (phyto and health certificates) with the Department of Agriculture, Fisheries and Forestry (DAFF, Australia), the Ministry of Primary Industries (MPI, New Zealand) and the Animal and Plant Quarantine Agency (QIA, Korea).

In developing a network of smaller independent IOS systems the Philippines were able to take advantage of opportunities, working together with those stakeholders and Government agencies that were ready to move on and respond to their specific needs and interests. These regulatory agencies, which engage service providers (accredited also by Customs), continue to enhance their systems, aligning with the NSW and Customs procedures and data structures whenever applicable. The agencies are able to validate that importers are accredited or registered with the respective agencies and Customs, pre-clear import items with descriptions, product code and/or HS Code as identifiers, and adopting electronic payment services for the settlement of permit fees. Currently, the agencies have embarked on the implementation export systems designed to interface with the NSW and Customs.

[33] Information provided by Francis Norman O. Lopez, President of InterCommerce Network Services, Inc., a value-added service provider accredited by Customs and other government agencies, and currently, Member of the Steering Committee of the Pan Asian e-Commerce Alliance (PAA). He works closely with Customs, Freeport and Economic Zone Authorities, the Department of Agriculture, the Export Development Council and other government agencies to facilitate trade by enabling electronic transactions between private companies and government agencies (B2G), as well as cross border information exchange

[34] The Philippine Economic Zone Authority (PEZA, www.peza.gov.ph) governing the 277 economic zones; the Clark Development Corporation (CDC, www.cdc.com.ph) and Subic Bay Metropolitan Authority (SBMA, www.sbma.com) governing the Clark Freeport Zone and the Subic Freeport Zone.

[35] Department of Agriculture (www.da.gov.ph)

[36] Bureau of Animal Industry (BAI, www.bai.da.gov.ph), the Bureau of Fisheries and Aquatic Resources (BFAR, www.bfar.da.gov.ph) and the Bureau of Plant Industry (BPI, www.bpi.da.gov.ph)

3.1. Two strategies for interoperability: centralization versus federation

In the international supply chain, procedures and information flows among government authorities and business stakeholders must be coordinated. With many IOSs already established, there is a pressing need to achieve interoperability of procedures and data among the IOS systems.

> Interoperability is defined as the ability of diverse systems and organizations to work together. It includes the ability of IOS systems to exchange information and to use this information for better processes. While the term was initially defined for information technology or electronic systems and services to allow for information exchange[37], a more broad definition takes into account social, political, and organizational factors that need to be interoperable to contribute for better performance.

Two basic strategies for coordination, which have been distinguished in organization theory for decades[38], are either centralized solution or network solution. The centralized solution involves setting up a centralized organization that manages data and processes. This implies creation of a centralized authority and jurisdiction which can only take place under strong political pressure and supportive legal framework.

[37] Institute of electrical and electronics engineers. IEEE Standard Computer Dictionary: A Compilation of IEEE Standard Computer Glossaries. New York, NY: 1990.

[38] March, J.G. and H.A. Simon (1958): Organizations, John Wiley.

The alternative strategy is the creation of independent IOS systems which collaborate to exchange data and synchronize processes. This requires a framework of standards and rules under which the IOS systems can develop interoperability. Interoperability requires standardization of interfaces between IOS systems but does not alter the internal systems and procedures of the agencies. Interoperability through standardization is frequently realized with the help of intermediate agencies called clearing houses[39] or access points providing supporting services for achieving interoperation[40]. The Internet operates under such principles.

IOS might also have a competitive edge with close regional integration of trade: While Single Windows are typically designed as a national facility, the IOS are often set up from the beginning in a cross border, regional context

In particular for large transnational initiatives, the solution can be in between these extremes. In such a hybrid solution data and services are often distributed on local or national level but development policies, common rules and possibly governance of the initiative is established by a central transnational body. Hybrid systems may also use dedicated central technical infrastructure to support a harmonized approach and information exchange between the federated systems.

Advanced economies have a strong preference for non-centralised or hybrid solutions. This means that they achieve interoperability of their IOS systems through a framework of standards and best practices for collaboration which may be supported by weak or strong centralised elements.

To sum up, interoperability between IOSs can be achieved through centralization or by creating a network of IOS systems based on a framework of collaboration. In advanced economies, there is a preference to establish interoperability by creating a network of IOSs or hybrid networks.

3.2. Interoperability between inter-organization information systems in developed economies

In highly developed economies, different types of inter-organization information systems (IOSs) have successfully been established and many more are in rapid expansion. These IOSs are commonly developed separately and used for different and specific areas of trade and transport facilitation, such as Port Community Systems (PCS)[41], Maritime Single Window[42]and Import Control Systems (ICS)[43].

[39] For example if two systems adopt WCO data model but one uses EDIFACT and the other XML the conversions are necessary. The greater is the extend of commonly accepted standards, the simpler is the role of the clearing house.

[40] Kubicek, H., Millard, J. and H. Westholm (2007), Back-office Integration for Online Services between organizations, in Anttiroki, A.-V. and M. Malkia (eds.), Encyclopedia of Digital Government Vol. I, Hershey IDEA Group, pp. 123-130.

[41] "How to Develop a Port Community System", European Port Community Systems Association, 2011.

[42] "Guidelines for Setting up a Single Window System in Maritime Transport", International Maritime Organization, November 2011.

[43] http://ec.europa.eu/ecip/help/faq/ens7_en.htm

Surveys and indicators[44] have shown that the synergy effects can be further leveraged if the separate information exchange platforms are electronically interconnected and interoperated, especially those facilitating different groups of closely related processes and information flows along the entire international supply chain. For example, many stakeholders responding to an EU online survey emphasized the importance to link e-Maritime with other relevant systems and initiatives, such as eNavigation, eCustoms and eFreight[45].

Interconnection among these inter-organizational electronic systems will integrate and streamline not just regulatory but also commercial, transport services and transportation related procedures and information flow for the whole-of cross-border trade operations.

Development pathways of NSWs for maritime transport differ from country to country but are commonly linked to Port Single Windows, which in turn are increasingly linked with Port Community Systems (PCSs). The new EU Directive on reporting formalities for ships, which requires all Member States to provide National Single Windows for maritime transport, has created a new impetus to developments in this area, a key dimension of which is co-operation at both EU and international level.

As these different IOSs evolve, they grow closer i.e. the same stakeholder joins different networks while the mandates, data and services of those collaborative networks start to overlap. An international supply chain transaction into and out of the EU today requires services from several of these systems. That means every international supply chain transaction needs to interface with many or all of these systems.

Therefore, a framework is needed that allows the different IOS systems to develop interoperability and to collaborate. Such a framework should allow the different IOS systems to build functional networks and to create a network of interoperability along the global supply chain. Such a framework needs to define i.e. data standards, modes of collaboration, responsibilities, legal terms and best practice.

Even in the highly developed economies of the EU that have spearheaded the development of IOSs there is not yet such framework available. As the IOSs are managing mission critical services for the national economy the development of such a framework should be a policy priority.

Many developing economies have started out with the implementation of a centralized Single Window solution. As their economies develop, they diversify their products and services, enter new supply chains and markets and start to deliver high value goods and services. The evolution of the economy leads to the need for diversified and specialised IOS networks that cannot be developed under a centralised Single Window programme. For them, such a framework will become highly relevant in the near future.

[44] World Bank's trading across border indicators (http://wwwd.doingbusiness.org).

[45] "Summary report of the contributions received to the e-Maritime public online consultation," European Commission, Maritime transport policy: ports & inland waterways, 2012 (page 12).

In conclusion, this section argues that establishing interoperability between these networks of collaboration will create important synergy effects for trade and the economy as a whole. As a centralized Single Window is not an option in many developed economies, an environment of interoperability should be created such that IOS can develop networks with other IOSs. This network should be developed in a user-driven and evolutionary way, based on market needs and readiness for collaboration. We note also that the establishment of such an environment is a responsibility of policy makers.

We argue that the framework of collaboration should be developed in an open policy driven environment with participation of all stakeholders. Once such a framework has been agreed, its implementation i.e. the establishment of links between the specific IOS systems should be left to the managers of these IOSs and driven by the specific needs and added value of the collaboration in an autonomous fashion.

An inter-governmental body such as the United Nations could play a role in the governance of such a framework.

4. A structure to classify different IOSs in international trade

In this section we propose to cluster related processes in the international supply chain into several groups. Different inter-organization collaborative platforms normally emerge from these sets of processes, and then lead to the development of different IOSs. This structure helps us understand the potential synergies and the needs of interoperability between different IOSs

4.1. A model to classify different inter-organization information systems in an economy

International trade transactions require a number of different business processes that need to be coordinated. Figure 2 illustrates some of the main business process areas along the international supply chain[46].

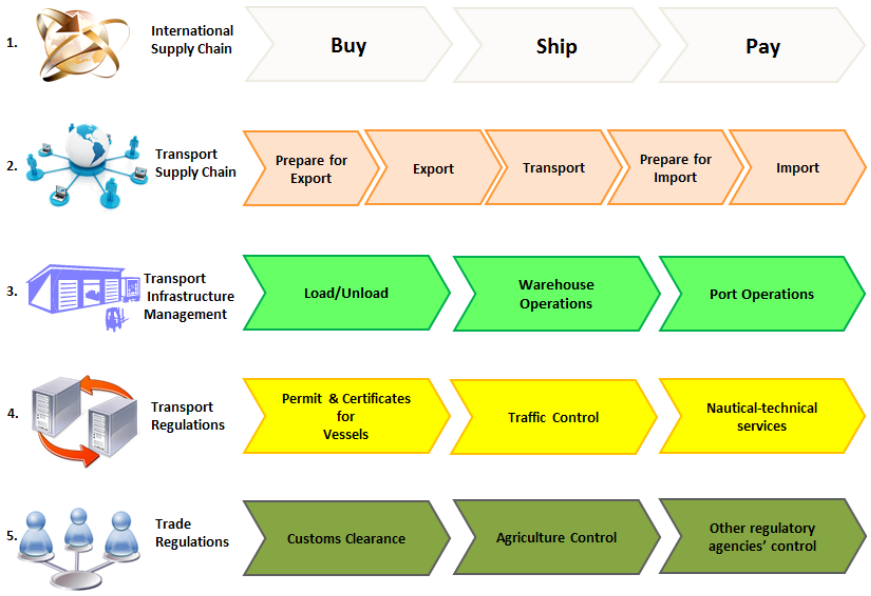

Figure 2- Layers of business process areas in the international supply chain[47,48]

At the top layer is the international trade transaction which includes processes related to purchase and order (Buy processes), the regulatory and transport processes (Ship processes) and Pay processes relating to settlement of payment. International trade requires transport services which includes processes to prepare for export, exportation and importation and related transportation (layer 2 in Figure 2).

[46] This model is built on the basis of the UN/CEFACT "Buy Ship Pay" supply chain model.

[47] This figure was inspired and extended from Figure 1 of "Guidelines for setting up a single window system in maritime transport," International Maritime Organization, November 2011.

[48] Note that Figure 2 is a much simplified international supply model and that real processes are significantly more complex. Also, these five levels especially the last four levels may be repeated several times over the freight operations, e.g. for transit cases, and the roles and actions on each level will often be intertwined with other levels' roles and actions.

The transportation may use sophisticated facilities such as sea ports, air ports, loading platforms or warehouses (layer 3 in Figure 2). In each of these transport facilities, multiple transport supply chain processes may be conducted.

The layers 4 and 5 are about transport and trade related procedures and documents. Layer 4 is related to transport regulatory procedures, for example, maritime transport clearance including the clearance of ships and immigrations, traffic control, piloting and environment protections. Layer 5 is related to trade-related regulations, for example, customs declaration and clearance, health and agriculture certifications.

Example:

For example, a process analysis study[49] of exporting rice from Thailand shows that thirty-six documents and one-hundred-twenty-three steps are required to coordinate the operations among fifteen actors including traders, several transport and logistics service providers, banks, insurance companies and five regulatory agencies. The study analysed holistically all processes and required documentation starting from the purchasing contract (buy process in layer 1) until the vessel carrying the container of rice leaving the Laem Chabang seaport in Thailand. About twelve days were required for procedures and documentation related to purchase contract, credit guarantee, cargo insurance and payment claiming preparation (process layer 1); seven days spent for transport and transportation related procedures including goods stuffing, hauler movement and terminal operator's operations (layer 2 & 3), and six days on procedures related to the application and issuing of export permit, phyto-sanitary certificate, customs declaration, customs clearance and technical control at the seaport (layer 4 & 5).

As noted before, IOS systems emerge around closely related groups of business process areas. We can use this structure of business process areas of Figure 2 to explain the structure and relationships between the IOS systems in the economy.

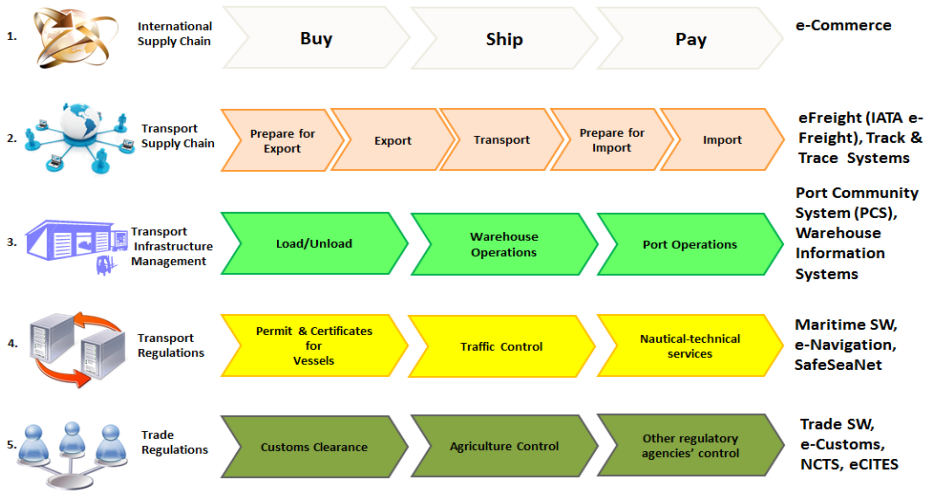

Figure 3 - Layers of business process areas and related IOS systems[50]

[49] As presented by Somnuk Keretho, "How to Plan Implementation of a National Single Window? (Using State of the Art Management Concepts for SW Planning and Implementation)," UNNExT Capacity Building Workshop for Cambodia Single Window Implementation, 29 March 2013, organized by UNESCAP and World Bank, with the Support of Thai Customs Department, Ministry of Finance and UNNExT.

[50] NCTS is New Computerized Transit System.

Figure 3 illustrates some IOSs closely related to several on-going EU initiatives. The layer model helps us to understand the needs for interoperability and potential synergies between IOS systems on the different layers.

Large IOS systems often cover business processes from different layers. For example, the EU e-Maritime initiative connects the layer three PCSs with the layer four National Single Windows and shares the information with all regulatory authorities in layer five. Furthermore, it provides the maritime element for the layer two e-Freight initiative.

The EU e-Freight initiative aims at connecting the different modal transport systems, including those of e-Maritime, in order to facilitate the movement of goods throughout the logistic chain.

The interconnectivity and interoperability among these IOSs as shown can be better aligned with the overlap of processes and reuse of relevant information. The proposed evolution development model aligned with these process groups will be further proposed in the next sub section.

In summary we have shown that business processes of international supply chains can be clustered into different functional layers. As IOSs respond to specific process areas in the supply chain, this model can also be used to cluster the IOS systems used in global trade.

4.2. Evolution and prioritization for IOS development

As already mentioned in Section 2, IOS systems in a country gradually evolve. Especially in Europe, these systems have been developed in a demand-driven environment with strong engagement of private sectors. This has led to the establishment of important private sector IOS systems in particular for transport infrastructure management (Layer 3 of Figure 3). A good example is the Port Community Systems of Northern Europe which provide collaborative and highly automated platforms in all major ports. The government focuses on developing IOS systems for trade and transport regulatory IOS systems (Layer 4 & 5). For example in Europe, the Maritime SW[51]and NCTS (New Computerized Transit System) each constitute major IOS systems that link various government agencies and private sector stakeholders involved in the regulation of trade and transport. There are numerous other IOS systems in the European Union that operate on a regional, national or local context. Because of the complexity of the European trade, the countries have never envisioned connecting all trade regulatory systems of layer 5 into a centralized SW but are rather looking into sharing of relevant information between these systems and those on layer 4.

Many countries in Asia and the Pacific region have, over the last 10 years, focussed most of their investment and effort in the development of trade regulatory IOS systems (Layer 5), in particular National Single Windows. These systems are now evolved to a mature level in some countries in the region.

[51] Directive 2010/65/EU of the European Parliament and of the council of 20 October 2010 on reporting formalities for ships arriving in and/or departing from ports of the Member States.

The focus in developing trade-related IOS and national and regional SW deflects from the development of other IOS systems in particular for the transport infrastructure management (Layer 3) and transport regulations (Layer 4). As of today, many Asia-Pacific countries still lack efficient IOS systems for port and infrastructure management, and also transport regulatory control. Asian supply chain logistics have attained the similar levels of complexity as in Europe countries but the performance of many Asian transport and infrastructure IOS systems (Layer 3 & 4) is much lower[52]. Policy decision makers should review priority for development of IOS systems in different layers in particular on layer 3 & 4 which receive much less focus.

[52] Few exceptions with very advanced systems are, for example, Shanghai's e-Port, and Japan's NACCS.

Evolution of a maritime Single Window: the example of Portnet, Finland

Finland, being one of the pioneers implanting national concept, could be taken as an example in the deployment of national infrastructure implanting the maritime Single Window concept. At the beginning of the 1990s there were up to seven different forms to fill in on arrival of a ship into a Finnish port[53]. 80-90 % of the content in these forms was the same, only the layout was incompatible. The content was rather basic, containing information on identification, expected time of arrival (ETA) or expected time of departure (ETD), cargo and dangerous goods (DG) details on a statistical level. Thus there was a lot of work done which was felt to be largely unnecessary and expensive.

A first system was developed which operated with a central database and dumb terminals. A Single Window interface was added later but without great success due to design flaws.

The pressure to build a completely new system mounted and when it was realised in 1998 that the system was not Y2K proof this gave a good reason to make a fresh start. There was a better understanding on system and user requirements and the design phase involved all relevant stakeholders.

The current system manages 40,000 ship calls and 70,000 cargos notices annually and has about 1000 users per day. All the players in the port environment are involved in using the system. Presently the system is paid and maintained by the Maritime Administration, the Customs Office and the 21 largest ports. The Border Guard is using the system. Hence the system encompasses the maritime safety, maritime security, cargo logistics and environmental aspects of maritime traffic.

The user (normally the ship agent or terminal operator) can give the following notices and get the following information: Port arrival notice (containing ship id, ETA, destination port, previous port(s), detailed dangerous cargo notice, cargo notice (initially on a statistical level, going in the direction of a general cargo declaration, accepted by the Customs office), passenger list, ship provisions); Port departure notice; issuing a single common customs reference number for the ship call, valid throughout the whole duration of the visit; paid fairway dues and authority decisions on exemption of fairway dues; list of exemption for line ships that have a contract with a local ship waste handling company; a request to the port to allow some particular DG into port and as a response the decision from that port on that matter; international Ship and Port Facility Security Code (ISPS) notice (security notice, prescribed by the International Maritime Organization (IMO)); terminal notice regarding containers; ship database, with relevant basic information on all ships that have visited Finland before; a restricted set of the International Maritime Dangerous Goods (IMDG) code database; UNLOCODE database, including port areas; database on ID and contact data on all agents using the system; database on ID and contact data for ports; to order port services, like towing, water electricity, telephone (a very little used feature); six IMO FAL forms produced automatically from the information are available.

This system is connected to the European Vessel Traffic Management system, SafeSeaNet. Currently, Finland is working to update the system to be compliant with the requirements of the Directive 2010/65/EU on Reporting Formalities which introduces a new data set, interoperability standards and the need to share relevant data with other EU Member States.

[53] http://www.unece.org/fileadmin/DAM/cefact/single_window/sw_cases/Download/Finland.pdf .

Table 1 - Criteria for policy makers to identify gaps in national IOS development

Layers	Examples of IOSs	Criteria for policy makers to identify gaps in national IOS development
International trade (Layer 1)	e-Commerce platforms are normally developed by private sector, e.g. Alibaba	Policy makers need to ensure that enabling e-commerce legal environment exists and supporting logistics infrastructure such as express carriers are available.
Trade regulations (Layer 5)	Normally driven by government agencies, e.g. Trade SW, eCustoms, and NCTS	Support policy objectives for trade, security, safety and environment protection; they are often developed to meet national and regional trade policy objectives and agreements. Policy makers should assess existing IOS systems and their stage of development. Policy makers should pay attention to the evolution of the national trade: if trade volume increases trade should be better regulated and managed.
Transport supply chain (Layer 4)	Normally developed by private sector companies or industry associations, for example IATA e-Freight, and Track & Trace Systems	Policy makers need to ensure that legal environment has been established and necessary international conventions have been ratified. Governments should promote, provide commentary funding and encourage key national stakeholders to participate.
Transport infrastructure management (Layer 3)	Normally developed either by private sector or public-private partnership initiative, e.g. PCS, Multi-modal transport information systems, and Warehouse information systems	IOSs for transport infrastructure management should be considered as a policy task. Criteria for priority are for example levels of automation and collaboration between stakeholders in major sea ports and air ports, comparisons on logistics performance if the neighbouring countries; feedbacks received from transport community. Policy makers should pay attention to the evolution of the national trade: if trade volume increases or more high-value goods are traded, the importance of IOSs for Transport infrastructure management increases. ISOs are also relevant for improving safety, security and environment protection.
Transport regulations (Layer 2)	Normally driven by government agencies, e.g. Maritime SW, e-Navigation, and Vessel Traffic Management	Support policy objectives for security, safety and environment protection; they are often developed to meet national and regional policy objectives and agreements. Policy makers should assess existing IOS systems and their stage of development. Policy makers should pay attention to the evolution of the national trade: if trade volume increases transport should be better regulated and managed.

In summary, we argue that countries of Europe and Asia-Pacific have applied different priorities when developing IOS systems in different layers. Asia-Pacific

countries have developed IOS systems primarily on the trade regulation layer while European countries took a more balanced approach. We also provide recommendations for policy makers, as shown in Table 1, with some criteria to assess national priority related to IOS development on the different layers.

4.3. Collaboration between IOSs

We have argued that the development of national economy and modern trading environment requires establishment of different IOS systems in a country, region or Economic Grouping. Each of the IOS systems create a community of stakeholders that are linked with modern information and communication technologies. Each IOS is specialized and delivers specific services for international supply chain operations.

In order to provide the complete set of services required for the international supply chain, the IOS systems need to collaborate. The collaboration can take places within each layer, for example, the links between e-Customs systems and electronic agriculture systems. The collaboration can also take places between different layers of IOSs, for example, the links between PCS and trade SW. Many such links between different IOSs would establish a network of inter-agency collaboration in the economy.

It is not necessary to establish collaboration and interoperability between each and every IOS systems. Instead, IOS collaboration is only necessary when and where it creates added value for stakeholders.

It is ultimately up to the stakeholders of the IOS to decide which links would provide added values.

Therefore, establishing links between IOS systems should be user-driven and left to the decision of stakeholders. The role of decision makers is to establish a framework that enables the collaboration.

In conclusion, the economy develops different IOS systems that eventually need to be interconnected to form national and global networks of collaboration among stakeholders along the international supply chain.

5. Creating the framework for IOS collaboration

5.1. A demand-driven strategy for IOS interoperability

As outlined before, establishing links between IOS systems must be demand-driven, and initiated by the IOSs that wish to collaborate. In order to collaborate, the different IOSs must agree on a set of common principles, rules and standards for exchange between IOSs but not within IOSs. We suggest that policy makers agree on such a framework of common principles, rules and standards that support interoperability between the IOS systems. The management of those IOS systems can make a self-declaration that their own system applies to the set of rules. Thus, two different IOS systems adhere to this framework will have a common understanding and rules for collaboration.

5.2. The framework for IOS interoperability

Interoperability between two different IOS systems requires among others the following:

- a vision for collaboration - added business value should be clearly defined in particular the benefits that collaboration brings to the stakeholders
- rules of engagement
- a framework of trust and service level agreements
- common understanding of shared business processes and data requirements
- common standards for data structures and data exchange
- Legal framework

We can structure these requirements into 3 layers namely, strategic view, business operational view and technical view as shown in Figure 4. For each of this layer, there are international accepted standards, rules and best practices available that can be referred to.

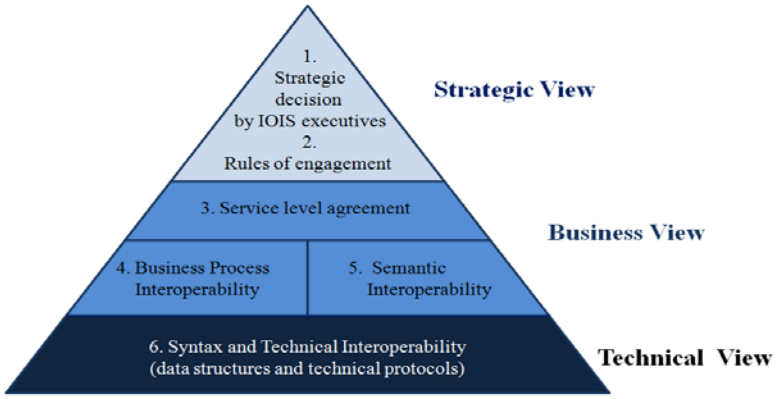

Figure 4 - Layers of interoperability between IOS systems[54]

The Annex A of this paper contains a draft Framework of Principles and rules for ISO to engage in collaboration[55]. The Annex is provided as an initial draft that would have to be further developed at a later time through an intergovernmental process.

54 Adapted from "Three Dimensions of Organizational Interoperability," Herbert Kubicek and Ralf Cimander, European Journal of ePractice, January 2009, and also the EIF v2.0 (European Interoperability Framework).

6. Conclusions and Recommendations

In summary, we discuss that as the economy develops there will be more and more IOS systems established which provide important services for trade and society as a whole. European countries have led the development of such IOS systems. Similar situations are now increasingly relevant for Asia and Pacific countries.

IOS systems can be clustered into layers according to closely-related business process areas of the supply chain. Policy makers need to have a balanced view in implementing IOS systems in their country to ensure that the different IOS systems cover all process areas of the international trade.

As more IOS systems are established in the economy, they begin to overlap in terms of stakeholders and services they provide. Significant benefits can be realized if collaboration between IOS systems is established. This collaboration requires a common set of principles, rules and best practices. We propose a framework of such set of rules to which IOS systems can voluntarily adhere to.

Recommendations for policy makers

1. To recognize the important role of IOS systems for the development of trade,
2. To make a national inventory of IOS systems in the country and to identify areas where additional IOS systems could improve efficiency and security of the international supply chain,
3. To negotiate at the international level a set of common principles, rules and best practices for IOS interoperability and to establish these rules as an international standard for IOS interoperability, and
4. To encourage decision makers of national IOS systems to adhere to this agreement.

[55] PEPPOL and the European eInvoice Service Providers Association (EESPA) have developed frameworks based on the European Interoperability Framework (EIF) model (see http://www.peppol.eu/peppol_components/peppol-eia#governance/transport-infrastucture/framework and http://www.eespa.eu/content/interoperability).

Annex A

The joint United Nations Regional Commissions Principles of engagement and best practice for trading in an open Single Window Environment

(Draft as of 1 October 2013; document for discussion)

We the Governments of …,

Conscious of the importance of trade as an engine of growth and development and of the need to increase the efficiency and security of international trade transactions;

Acknowledging the needs of Governments and the society in general for efficient regulation of cross border trade to ensure safety, security and environment and consumer protection;

Acknowledging also the need for efficient and open cross border trade that provides opportunities for developing our economies;

Observing that modern cross border supply chains require trusted and efficient collaboration between many different stakeholders from the public and private sector of multiple countries and regions, operating under very different restrictions, legal environments and governance systems;

Recognising that in developing countries centralised, national Single Windows have been very successful in facilitating trade;

Recognizing that in many developed economies a variety of highly advanced inter-organization information systems have emerged, which support information management and collaboration of stakeholders in the supply chain;

Observing that these Single Windows and inter-organization information systems are becoming critical components for the -functioning of the global trading system, providing efficiency and a trusted environment for all;

Expecting that the further development of global trade, the increasing demand of our societies for efficient regulation of trade and the rapid development of Information and Communication Technologies will further accelerate the adoption of trading through inter-organization information systems;

Recognising the increased need for collaboration between currently isolated inter-organization information systems to provide high value added and holistic solutions to Governments, the trade community and society;

Desiring to formulate a voluntary Principles of engagement and best practice for inter-organization information systems that will facilitate the establishment of collaborative networks in cross-border trade and further expedite the development of inter-organization information systems and Single Window systems;

Establishing and fostering/ a holistic Single Window trading environment in which IOS and Single Window collaborate and exchange Information to provide high value added services to Government agencies and the private sector stakeholders for inclusive, sustainable and secure cross border trade for all.

Recommend to inter-organization information systems (from now on referred to as "the Enterprise") that participate in cross-border trade transactions to adhere to the UN **Principles of engagement and best practice for trading in an open Single Window Environment**

UN Principles of engagement and best practice for trading in an open Single Window environment:

Article 1: Objective

The objective is to facilitate collaboration and information exchange between inter-organization information systems to provide highly integrated and networked services to the stakeholders of cross-border trade.

Article 2: Scope

The Principles of Engagement apply to inter-organization information systems that support cross-border trade transactions and that have declared conformity of their operations with the Principles.

Article 3: Definitions

For the purpose of this Arrangement/Agreement:

List of definitions still to be decided

Article 4: General Principles

The following general principles guide the Principles of Engagement:

1. Recognition of the legitimate interests of all stakeholders that participate in cross-border trade transactions.
2. The intention to simplify trade and to regulate trade effectively.
3. Creation of an inclusive trading environment that is open to participation of all enterprises, including small and medium-sized enterprises, and traders from developed, developing countries and transition economies.
4. Application of open, global standards and best practices for trade and electronic business.
5. Collaboration between stakeholders through creation of a trusted operational environment using modern information technology and management concepts.
6. Establishment of an open and demand driven collaborative network of inter-organization information systems.
7. Creation of advanced, value-added and competitive services to stakeholders in a market-driven environment.
8. Compliance with these Principles of Engagement is voluntary. Through self-declaration.

Strategic view on participating in a global Single Window environment

Article 5: The Enterprise as a member of the global Single Window Environment

The Enterprise provides services and electronic information exchange to its stakeholders in a trusted environment.

The Enterprise recognizes the potential of synergies offered through collaborating with other inter-organization information systems on the national and international level.

The Enterprise regards itself as being embedded as an independent, constructive component in a larger, global and self-organizing network of enterprises participating in the Single Window Environment that deliver services to Governments and trade based on these Principles of Engagement.

The Enterprise recognizes the vested interest of any other Enterprise in the Network to engage in high-level managerial negotiations on collaboration.

The Enterprise will formally acknowledge and respond to any proposal of collaboration made by another Network Enterprise that is based on best practice for a proposal for collaboration.

Although there is an obligation for the Enterprise to consider any proposal made, there is no obligation for it to engage in a negotiation of collaboration.

Article 6: Best practice for submitting proposals for collaboration

A proposal for collaboration should include:

- An outline of the vision for the proposed collaboration
- A list of services and products that can be provided through the collaboration
- The benefits for each of the partners in the collaboration
- A proposal for the initial and the sustainable funding of the collaboration
- An estimate of the costs and benefits
- A detailed and specific list of benefits for the stakeholders of each
- Management principles for implementing and operating the collaboration.

Article 7: Best practice for rules of engagement

Enterprises that engage in formal collaboration create a new collaboration mechanism in international trade that is at the disposition of Government agencies and traders. The Enterprises will provide the following summary information about the collaboration:

- Objective
- Services offered
- Accessibility (who can participate)
- Data structures used in information exchange

The information will be made available at the latest when the services are offered to stakeholders. IT is updated regularly.

Article 8: International Standards for Exchange of trade-related Data and Documents in Electronic Form

The Parties endeavour to apply international standards to ensure regional and global interoperability in paperless trade.

Specific Standards still to be decided.

Article 9: Relation with Legal Instruments Enabling Cross-Border Paperless Trade

The Parties endeavour to ensure that cross-border exchange of trade-related data and documents in electronic form are consistent with regional and international law, regulations and best practices.

Specific Instruments still to be decided:

Article 10: Legal Liability Framework

The Parties endeavour to establish an adequate legal and regulatory environment to address specific liability and enforcement issues that may arise in relation to the cross-border exchange of trade-related data and documents in electronic form through the collaboration.

BUSINESS OPERATIONAL VIEW ON PARTICIPATING IN A GLOBAL SINGLE WINDOW ENVIRONMENT

Article 11: Documentation of Business Process

Precise understanding of the interface business process of the Enterprise is important for any Network Enterprise that wishes to enter into collaboration. The Enterprise will therefore document and make publicly available a business process description of the core services it delivers.

Article 12: Rules for Documentation of Business Process

Business processes are documented on the basis of the following principles:

- International standards and guides for process description such as UML.
- The use case focuses on the interface between the Enterprise and its stakeholders and relevant to trade transactions
- Process descriptions provide information on the main activities under each use case
- Process descriptions are made publicly available in electronic format
- The Enterprise will review and update process descriptions on a regular basis
- Process descriptions that are made available are for information only

Article 13: Documentation of Data Structures

Precise understanding of the interface Data Structures of the Enterprise are essential for any Enterprise (IOIS) that wishes to enter into collaboration. The Enterprise will therefore document and make publicly available descriptions of the data structures of the core services it delivers for the Open Single Window Environment.

Article 14: Rules for Documentation of Data Structures

Data Structures are documented on the basis of the following principles:

- Data Structures are documented using international standards and guides
- Enterprises that use proprietary data structures in their interfaces will provide a mapping of these structures to a data description using the international standards and guides
- Data descriptions will at least include the semantic description of data on aggregate and attribute levels.
- Data descriptions are made publicly available in electronic format
- Data descriptions are reviewed and updated regularly
- Data descriptions that made available are non-binding

Annex B

Examples of Port Community Systems

The following URL: **http://www.unece.org/ece/trade/411.html**, provides examples of Port Community Systems, some of which have been operating for over 30 years, and how they integrate and exchange electronic information with other systems thus create an IOS. This information has been provided through the European Port Community Systems Association (EPSA).

Annex 1 - DAKOSY, Hamburg
Annex 2 - Portel, Spain (Small and medium sized ports)
Annex 3 - MCP Plc, UK
Annex 4 - Port base, Netherlands
Annex 5 - Portel, Spain (Moroccan PCS and Single Window)
Annex 6 - dbh, Germany (Port Community System)
Annex 7 - dbh Germany (Port Operation System)