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PORT COMMUNITY SYSTEMS: REQUIREMENTS, FUNCTIONALITIES AND IMPLEMENTATION COMPLICATIONS

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ABSTRACT

Port Information Systems have made their appearance in the early 70's and have gradually been implemented in a wide range of port operations including sea-side and yard-side planning, management and control as well as port's communication with its "clients". The evolution of port communication requirements and technologies led to Port Community Systems, which can integrate the multiple individual systems operated by the actors that make up a seaport community, as well as common Single Window systems interconnecting the individual port communities. The scope of the current work is to present the user requirements, functionalities and ways to overcome complications in the implementation of Port Community Systems (PCS).

Keywords: Port Information Systems, Port Community Systems, Single Window

1. INTRODUCTION

World trade is driving the global economy and through international transportation connects markets and industries. With more than 80% of world trade transported by sea, the proper operation of ports is of critical importance. To this aim, port information systems have made their appearance in the early 70's and have gradually been implemented in a wide range of port operations including sea-side and yard-side short-term planning, management and control of actual operations as well as administrative and financial management (invoicing, Customs clearance, sanitary inspections etc.). Another functionality that progressively integrated in the port information systems is the communication (via electronic data exchange) among the various port actors. The term "actors" typically includes the Port

Authority, the Harbour Master, Terminal Operators, Shipping Agents, Freight Forwarding Agents, Tugboat and Pilot services, Mooring services, Waste Treatment companies, vessel supplies companies, the Customs Authority, Customs brokers, the Police and fire departments, security of port area and gate control, inspection services and haulers (see Figure 1). It may also include actors of processes related to other-than-Customs inspections for health, animal and plant, sanitary and phytosanitary, food and drug safety etc.

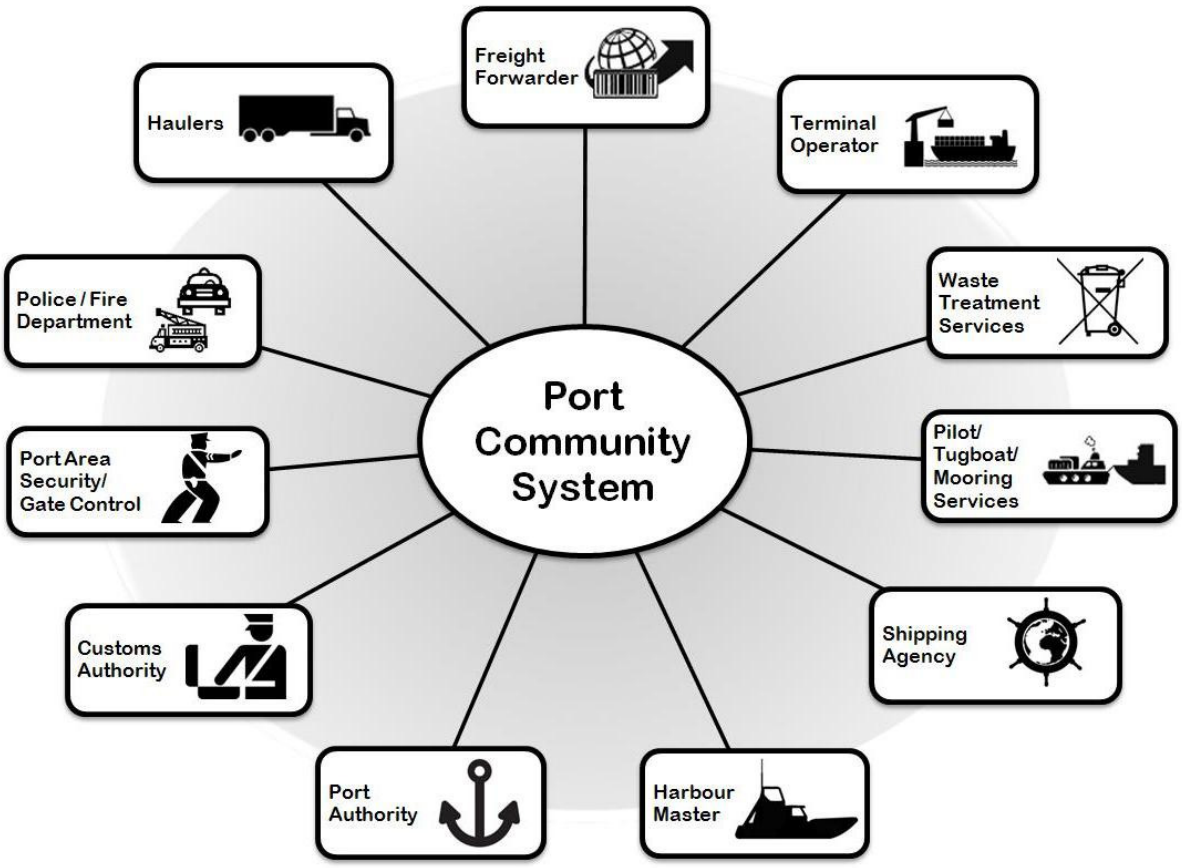

Figure 1 - Communication pattern within a Port Community System

The increased importance for the communication among port actors has transform port information systems into port community systems. A Port Community System (PCS) is defined as an information hub that electronically integrates a group of interacting authorities and stakeholders associated to a port into a global communication network. Its main objectives are to enable the seamless exchange of relevant logistics information and to ensure the smooth flow of shipments to, from and through a port (see Posti et al., 2011; PORTEL, 2009; Rodon & Ramis-Pujol, 2006; Srour et al., 2007; Tijan et al., 2009). The ideal operation of a Port Community System involves no need for bi-directional communication lines between the various port-related actors, as they all have access to the information they

need through the central communication system (Smit, 2004), allowing for clerical and paperwork reduction, as well as improved information quality (Long, 2009).

The functionality of PCS is strongly related to the concept of "Single Window" that has gained considerable momentum over the past ten years (Koh Tat Tsen, 2011). The use of a Single Window aims at one time submission of standardized information and documents, sharing of information among government agencies, as well as coordinated controls and inspections of the various governmental authorities. It also allows for payment of duties and other charges and becomes a valuable source of trade related government information (Butterly, 2012). Another definition of Single Window concept describes it as *"A facility that allows parties involved in trade and transport to lodge standardized information and documents with a single entry point to fulfil all import, export and transit-related regulatory requirements. If information is electronic, then individual data elements should only be submitted once."* (UN/CEFACT, 2005).

The terms "Port Community System" and "Port Single Window" are sometimes used indifferently while in other cases one is considered as subset of the other. If someone insists on differentiating these two concepts, we may say that the Port Single Window System has a Business-to-Government (B2G) character, as it provides local level information about the vessel to the authorities on a port level, while a Port Community System has a Business-to-Business (B2B) character acting as a tool to exchange commercial and logistics information among the members of a port's community (PORTEL, 2009).

The scope of the current work is to present the user requirements, functionalities and ways to overcome implementation complications of a Port Community System. The study includes the literature review on the development of PCS and Single Window systems (Section 2) and the problems/implications identified through the research work focusing on the development of a Port Community incorporating three Mediterranean ports (Section 3). Section 4 hosts the conclusions and the discussion on the relevant implications.

2. PORT COMMUNITY & SINGLE WINDOW SYSTEMS: LITERATURE REVIEW

The literature on Port Community Systems, although not as extensive as of other port-related issues (e.g. container port and terminal design) includes certain comprehensive manuscripts. Among them the works of Smit (2004), Polydoropoulou et al. (2011), Keceli et al. (2008a/b/c) and Posti et al. (2011) provide extensive state-of-the-art sections that include paper reviews on PCS development, lessons learned and factors affecting successful implementation as well as the associated implications and intricacies.

Smit (2004) described the Port Community System as: "*a central point for an organization to deliver/receive information, as well as to improve the communication efficiency and effectiveness in the port*". The thesis studied and compared the Port Community Systems of

the ports of Antwerp, Hamburg and Rotterdam and identified the differences and similarities among them.

The complexity and intricacies of integrating a group of firms and systems with a PCS were investigated by Rodon and Ramis-Pujol (2006) using the case study of ePortSys system in Spain. The main complications were the companies' willingness to retain their autonomy, the linking of the system with other industries' infrastructure, the limits of the standard, the difficulties in aligning the interests of various actors, the consequences of tighter integration with the system and the unexpected uses and effects of the system.

Srour et al. (2007) documented the lessons learned within each life cycle stage as derived from an international study of port community system deployments and suggested a four-step process of designing and implementing a port community system. It was stressed that the most important factor for a successful implementation is a modular formation, with each module having clear goals and quickly achieved, tangible benefits for all actors involved and for the emerging needs of evolving business practices.

Mila (2007) gives an overview of PCS and presents the results of a survey about the characteristics of PCS in twenty seven ports. Diop (2007) describes the basic characteristics of a Port Community System, indicates suitable architecture and explains the design of such a system in the Port of Dakar (Senegal). Keceli et al. (2008a and 2008b) studied the factors affecting the acceptance and adoption of Port Community Systems by the sea and land carrier companies using the case study of Busan Port in South Korea. They concluded that factors related to high level manager support, technical and non-technical readiness, competition and understanding of the system benefits, have the most important influence for the adoption of PCS's. Technical reliability, security and easy networking seem to have greater importance for users comparing to cost. Another study on the Busan Port was undertaken by Keceli et al. (2008c) who evaluated several technical aspects of South Korea's national port community system (PORT-MIS) from the users' point of view through a questionnaire survey targeted to sea and land carriers in the port region and interviews with the system operators. The results showed that the PORT-MIS users are satisfied with the current level of the system in some extent, but the system still needs further improvement in certain areas.

Polydoropoulou et al. (2011) examined the adoption process of PCS in the Container Terminal of the Port of Thessaloniki (Greece) regarding key aspects of development and adoption of Information and Communication Technology (ICT) innovations. The authors concluded that the application of ICT usually brings about "system" changes, which affect the organization, management and production procedures, especially in the case of ports being multifunctional and multi-actor organizations. More specifically, the factors facilitating the adoption of the PCS in the Port of Thessaloniki are the commitment of Port Authority managers, the realistic positive impacts on the efficiency of the port's services (due to paperless exchange of information), the satisfaction of the port clients (due to reduced congestion) and the overcoming of the employees' reactions and resistance to technological change.

An additional major challenge in the creation of a PCS is the assurance of information security. Aksentijević et al. (2009) stressed the importance of cooperation and use of common security language among the involved PCS stakeholders and the internal education for users to achieve the optimal organizational security. The standardization/certification of information security practices and the system's risk management were also recommended in order to ensure its stability. Tijan et al. (2009) outlined the structural analysis of a PCS, its main internal and external stakeholders and the role of the typical information and telecommunications infrastructure. Moreover, they emphasised on the need for information security within the PCS and discussed in detail the business functions of disaster recovery and business continuity. They suggested the creation of a robust business continuity plan, as part of an overall risk assessment process, with the objective to ensure the functioning of a PCS in case of disastrous event or a foreseen disruption in line with the port's ICT system risk analysis.

Keretho (2011) presented which way a PCS can be developed following the Single Window concept. The roadmap includes five development stages. The first step concerns the development of a paperless Customs declaration system, including electronic payment for customs duty and exchange of container loading lists and simple electronic documents with Port Authorities and/or Terminal Operators. The second step is about the integration of other administrative and regulatory bodies which are engaged in the export/import procedures, i.e. the connection of other government back-end IT systems and exchange of electronic permit with paperless customs system. In the third stage the project is extended to serve entire business communities, i.e. electronic exchange of documents among stakeholders in the air, sea and land side communities (insurance companies, airlines, duty free zones, airport/port authorities, ship agents, terminal operators etc.). The next step is to create an integrated national electronic logistics platform, interlinking the administrations, companies and service sectors to improve the import/ export operations management. This also involves information exchange among traders, freight forwarders and logistics-service providers, as well as banks for various kinds of electronic payments. Lastly, the fifth stage covers the integration of national logistics platforms into a regional information-exchange system or even a cross-border paperless trade environment.

The authors of this work had the opportunity to gain pragmatic experience on the subject of PCS and Single Window implementation during their participation in the on-going research project described analytically in the following section.

3. PCS DEVELOPMENT IN ADRIATIC SEA

The Adriatic Sea lies in the north part of the Mediterranean Sea between the Italian Peninsula and the Balkan Peninsula. The countries with coasts on the Adriatic are Italy, Albania, Montenegro, Bosnia-Herzegovina, Croatia, and Slovenia (see Figure 1). A considerable number of ports, including the ports of Trieste, Venice, Brindisi, Ancona, Bari,

Ravenna, Koper, Rijeka, Split, Ploče and Bar operate in this region, serving significant cargo and passengers flows. In its southernmost part, the Adriatic Sea outflows to the Ionian Sea allowing connection to the Greek ports of Igoumenitsa and Patras.

Figure 2 - Location of the APC ports

The project “APC - The Adriatic Port Community” concerns the development of Port Community Systems that will initially include three ports of the wider region, namely Venice (Italy), Ploče (Croatia) and Igoumenitsa (Greece), as well as the development of a “common window” for the exchange of useful information among the local PCS’s. One challenging aspect of the project is that the aforementioned ports have different characteristics and degrees of information technology implementation.

The port of Venice in North Italy includes 33 terminals with 163 active berths, occupies 2045 hectares of land and has 30km of quayside. The port serves 2 million passengers and 2.6 million tonnes of cargo per year. The port already operates a PCS connecting most of the actors of the local port community that is gradually expanded to include additional functionalities such as gate control, integration with Customs, information exchange with other ports etc. (VPA, 2012).

The port of Ploče in South Croatia is primarily a cargo port having 5 berths that handle 4.5 million tonnes of dry bulk, general cargo, containers and liquid cargo. It occupies 120

hectares and has two ramps for passenger traffic (via Ro-Pax ships). The port operates individual information systems. The process for the development of an integrated PCS system is on-going (PPA, 2012).

The port of Igoumenitsa in West Greece serves mainly Ro-Pax ships to/from many Italian ports (7 berths/ramps). Despite its small area of 21 hectares, the port has an impressive annual throughput of 1.1 million passengers, 300000 cars and buses and 150000 trucks. In September 2012 the port initiated the process for the development of its PCS (IPA, 2012).

Under the umbrella of the APC project, Venice, Ploče and Igoumenitsa Port Authorities are cooperating to improve or develop their Port Community Systems and in parallel are developing a web-based communication application that will allow for data/information exchange among their systems.

The concept of information exchange among ports is not new. Typical communication tasks performed in everyday operations of the maritime business include the early transmission of the ship's bay plan as well as the monitoring of dangerous cargoes and the monitoring of ships for safety reasons.

The transmission of the ship's bay plan before the actual ship arrival at a port is an established practice for the Shipping Agents (but not always for the Terminal Operator). A bay plan is a document listing the container number and position in the various ship cells. This information (if properly used) allows for the planning of port's seaside and yard-side handling processes and for the estimation of the necessary resources (quay cranes and quay-to-storage area transfer equipment). Many, but not all, Terminal Operators have already taken advantage of this information to efficiently plan their everyday operations.

One of the first applications for the monitoring of dangerous cargoes was the Substance Information for Ship Transport and Emergency Response (SISTER) in the Port of Rotterdam, which is a subsystem of the central Vessel Traffic Control system monitoring the wider area of the port. The SISTER is a special IT system which was developed in order to optimize the monitoring of ships announcements carrying dangerous cargoes as well as to support and accelerate the port authorities in case of emergency. This system offers the basic structure to effectively control the shipment, management and unloading of dangerous goods (Koinis & Spyrou, 1997). In European level, the information exchange with other ports is facilitated by the European Water-Traffic Information System (EWTIS), which was designed to create a maritime information system for hazardous goods monitoring in a uniform and standardized format (Vogelaar, 1993). The main goal was to design a real-time port-to-port and ship-to-port communications system to prevent accidents at sea and limit the effects of marine pollution in the event of an accident, as well as to quickly provide all the necessary information to Search-and-Rescue organisations. It would also enhance the standardization of waste tanks at ports and monitor "suspicious" ships aiming at reducing the volume of waste discarded at sea (SICE, 2012).

In addition to the above communication practices already in use, strong initiatives are carried out towards the enhancement of data exchange between the maritime administrations of the member states of the European Union (EU) and European Economic Area (EEA). The Directive 2002/59/EC defines that it is the responsibility of the ship operator, agent or master to notify the port authority or competent authority, prior to entry into a port of a member state, some specific information and some additional information when carrying hazardous goods on board within European waters. Also, member states shall monitor ships operating in their mandatory ship reporting systems and vessel traffic services based on guidelines developed by the International Maritime Organization (IMO). SafeSeaNet (SSN) is a specialized network established to facilitate the data exchange in an electronic format between the maritime administrations of the member states. The system has been developed with the goal to enable compliance with the above-mentioned legislation and additionally with other instruments related to port reception facilities and on port state control. It has been designed to be available round the clock with a high level of reliability and security. SSN provides a default network/web interface based on the concept of a distributed database (EMSA, 2006; PORTEL, 2009). An unambiguous deadline has been put forward by a more recent European Directive 2010/65/EU on reporting ships formalities. All EU member states must be able to accept electronic reports via a Single Window by June 1, 2015. These new requirements apply to the reporting formalities applicable to maritime transport for ships arriving in and ships departing from ports in EU countries. The goal is to provide the business community with a streamlined process for submitting export and import information to customs and other government agencies. In the Directive it is outlined that each EU country must ensure that the reporting formalities at their ports are requested in a harmonized and coordinated method.

In alignment with the above guidelines Venice, Ploče and Igoumenitsa Port Authorities are cooperating to improve or develop their local Port Community Systems and in parallel are engaged to the development of a web-based communication application that will allow for data/information exchange among their systems. The above tasks commenced with an in-depth analysis of service processes and user requirements in each port which concluded that the most important barriers to be overcome are: (a) the non-uniformity of the documents used (b) the manual submission of many documents and the lack of integration of IT systems (c) the lack of integration of Customs, (d) the extraction of usable information from databases and (e) the difficulties in automating several port functions including harbour master's checks and gate control. In the following paragraphs these subjects are analytically presented.

Non-uniformity of documents used

Significant effort has been given by the international shipping world for the harmonization of the documents used in the shipping activities. A practical solution to that has been proposed by the IMO Convention on Facilitation of International Maritime Traffic (FAL Convention) entered into force in 1967. IMO describes its purpose as: "*to facilitate maritime transport by reducing paper work, simplifying formalities, documentary requirements and procedures associated with the arrival, stay and departure of ships engaged on international voyages*". The Convention included a list of documents which public authorities can demand of a ship

and recommends the maximum information and number of copies which should be required. IMO has developed standardized forms for seven of these documents:

1. General Declaration (ship name, voyage number, IMO code, date/time of departure/ arrival, previous port of call, waste treatment requirements etc.).
2. Cargo Declaration
3. Ship's Stores Declaration
4. Crew's Effects Declaration
5. Crew List
6. Passenger List
7. Dangerous Goods Manifest

The European Directive 2002/6/EC has introduced the recognition of the IMO facilitation forms at European level. The Member States should recognize these forms and the categories of information in them as sufficient proof that a ship has fulfilled the reporting formalities these forms are intended for.

Nevertheless, at port level, each information system is usually customized to the port specific needs (which sometimes derive from national legislation) in order to produce the reports (e.g. for ship and equipment monitoring) and documents (in the form required by Customs, Gate inspection etc.) used in everyday operations. The analysis of the documents used for reporting ship formalities in the Venice, Ploče and Igoumenitsa port confirmed that they somehow deviated from the strict IMO form: some forms contain much more information (like ship characteristics and voyage details), while others avoid to replicate data/information already provided in other port's forms. To overcome this problem the APC partners provided the interrelation of all currently used forms with all standard IMO documents (field by field comparison). This technique allowed for the linking of records of the data model used in the computerized system of Venice port with the spreadsheets and hardcopies used in Ploče and Igoumenitsa ports. Idiomatically speaking, this approach can be described as the Rosetta Stone (an inscription having the same text written in three different languages that provided the deciphering key for Ancient Egyptian hieroglyphs) for the port logistics management of the three Adriatic ports. This "decoder" allows local users to exchange information from heterogeneous sources and "read" it in their language and in the format they are familiar with, thus minimizing the possible miscommunications and maximizing the degree of system's acceptance and adoption by all ports.

In addition to the above IMO forms, the APC identified the need and also the willingness of Port Authorities to release and exchange data concerning supplementary documents prepared for common use. These documents are:

1. Truck list (licence plates, type/weight of cargo) and Vehicle list (for Ro-Pax vessels).
2. Container list (for container carrying ships)

Figure 3 depicts the conceptual design of the information exchange process from a local user within a PCS, via the Global Single Window to a cooperating PCS actor. The system's

architecture includes an authentication check that through access privileges allows for the retrieval of the required information while prohibits unauthorised persons to have access to commercially sensitive data of other users. The GSW-PCS Local Module "knows" the correspondence between each field of an IMO form and the "address" of the relevant data field in the local database. By retrieving the correct data elements, the IMO form is properly populated.

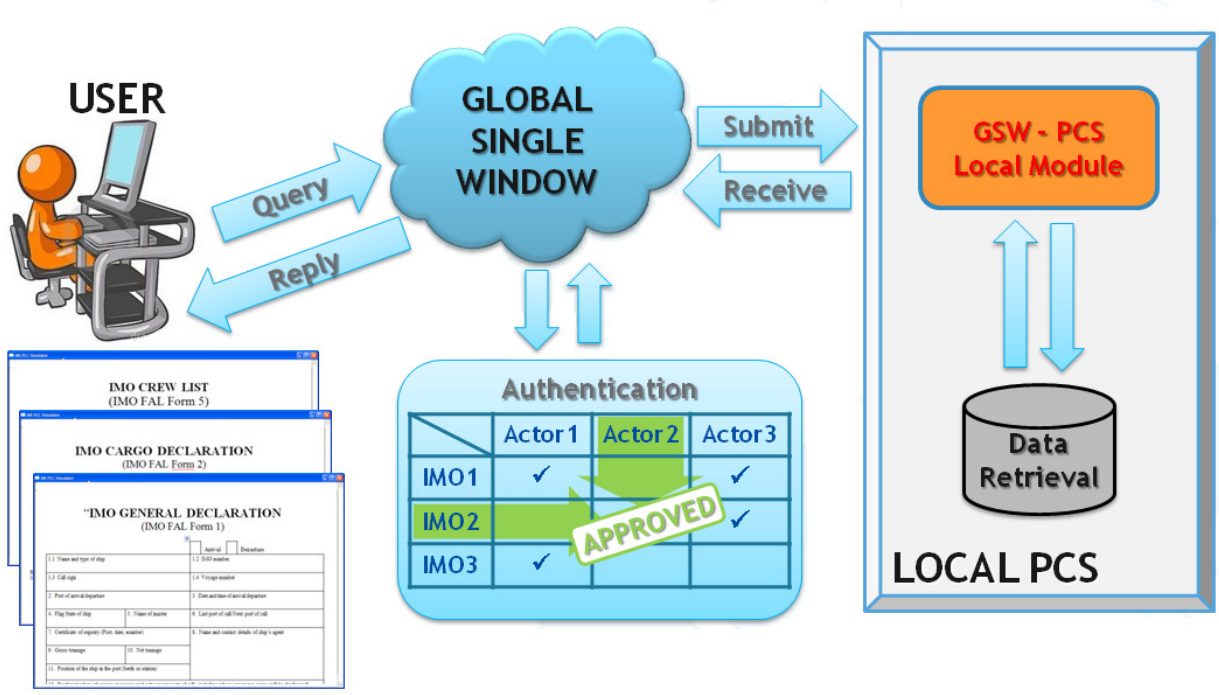

Figure 3 - Communication schema between Global Single Window and local PCS

Manual submission of many documents - Lack of integration of IT systems

The great number of parties involved increases the requirements for information and document exchange which unfortunately (and despite the development in ICT and trade data-exchange standards) remains mostly paper-based (Koh Tat Tsen, 2011). An indicative example of the enormous workload that is inherent to trade formalities has been provided by Keretho (2011) and concerns the process of exporting rice from Thailand that requires 36 documents, 15 parties and more than 700 data elements to be filled in with an average handling period of 16 days. A recent analysis of World Bank (2012) regarding the procedural requirements for exporting and importing a standardized cargo of goods counted the documents associated with every official procedure (from the contractual agreement between the two parties to the delivery of goods) along with the time necessary for completion. Across the different regions of the world, the average number of documents and the time needed for an export vary from 4 to 8 documents and from 10 to 32 days respectively. Similarly, the

import-related documents range from 5 to 9 and the required time from 10 days (in OECD region) to 37 days (for sub-Saharan Africa).

The electronic submission of this information seems to be a solution in reducing paper work and duration of procedures, yet compatible IT systems are required.

Venice Port Authority (VPA) has a Port Community System, called *LogIS*, which is a web-based software application enabling intelligent and secure exchange of information between public and private stakeholders of the port community. It is composed by a set of modules integrated in a unique front-end interface so that it follows the "Single Window system" approach and it dialogues with third party software applications through a technical component for Electronic Data Interchange. The port actors generally use IT systems to produce or register the documents, yet certain documents are submitted in such a format that the operator is obliged to manually input data, e.g. unstructured documents received by email or fax. Examples of these types of documents are: Crew and Passenger Lists, incoming Customs forms, gate control procedures and documents.

Ploče Port Authority (PPA) does not use a Port Community System, even though there are many port-related parties and operators who have their own IT solutions. The majority of parties communicate within their organization in electronic form, while the exchange between different parties in most cases is paper based as their systems are not interconnected. Regarding the gate control and operations, all documents related to the trucks entering the port area for loading/unloading are exchanged in paper form. In some cases, certain documents are submitted electronically, but must be kept in hardcopies too.

The Port of Igoumenitsa does not yet have a Port Community System, so the data transfer between the port's stakeholders is based on papers, telephone and fax, thus performed manually. Physical appearance is also required in some processes. The port-related actors have their own different IT systems, but they do not allow electronic data interchange except for e-mail. Igoumenitsa Port Authority (IPA) has two individual IT systems, one for Electronic Protocol while the other for Building Management. The Port Authority has implemented research projects for information management and for management of passengers, cars and trucks embarkation, yet these applications are still in pilot phase. Shipping agents have centrally managed IT systems operating in closed intranet networks which are however not used to submit data to port authorities/agencies (IPA, 2012).

Lack of integration of Customs

The integration of the Customs processes in a Port Community System is the most difficult element of the puzzle. Customs involve paper work in a heterogeneous operating environment. Nevertheless, certain IT advancements (e.g. electronic transmission of Customs readiness both to Terminal Operator and Shipping Agency) would positively affect the efficiency of the relevant processes (VPA, 2012). A database including customs documents and the corresponding clearances (issued by the Customs agency and relating to

the shipments crossing the port area) seems adequate to solve the problem and could also be used to control traffic at the gates.

In the port of Ploče, the Customs authority has initiated the application of a national system (*NCTS*). The new Customs system is based on the exchange of electronic messages/ documents signed with electronic signature based on digital certificates for authorization. Nevertheless, the current procedure under Customs supervision is still based on hard copies of paper declarations (PPA, 2012).

In the port of Igoumenitsa the Customs Authority has its own centrally controlled IT system, called *ICISnet,* connected to the General Secretariat for Information Systems of the Greek Ministry of Finance and is using it for a significant part of the customs procedures between the port users and its supervising body, along with the traditional methods of fax, telephone, etc. (IPA, 2012).

Extraction of usable information from system databases

The extraction of useful information out of the enormous amount of data stored in a system's database is a target always sought by the developers. Typically, an artificial intelligent component is required to convert data/documents into usable information. For example, a tug report (describing the process of departing ship's maneuvering) by itself is not providing utilizable information. However, if this report is submitted just after the completion of the tugging of a departing ship and the submission time is compared against historical data of the same process for the same ship, information about the ship's delay can be revealed.

An artificial intelligent component may also be developed for the Customs and Port Security agency that will utilize data from the passenger list and the cargo manifest for trucks that contain information about driver ID, truck plate number, type and quantity of goods, etc. These data are recorded by the Shipping Agents who have the obligation to submit them to the Port Authority only in exceptional cases (e.g. naval accidents). Although useful, this information is currently not a part of a PCS. The reason is the need to avoid increasing workload and complexity of reporting formalities (imposed by Directive 2002/6/EC).

Difficulties in automating several port functions

Certain port functions require a radical restructuring in order to become operating elements of the PCS. Gate Control and Harbour Master inspections are characteristic examples.

The sub-system of Gate Control should be effectively accommodated in a Port Community System. An electronic notice of truck arrivals would allow terminal operators and Customs/Police to properly plan ahead their activities and resources. All three ports of APC reported significant delays and bottlenecks detected in the Gate processes. Potential solutions to this inefficiency require the involvement of truck drivers: informing the drivers

about the readiness of their cargoes allows them to plan their trips to port in time, avoiding unnecessary waiting time and congestion inside and outside the port's area.

The inspections performed by the Harbour Master cannot be easily automated, as they normally require physical appearance on the ship or the manual submission of the ship's logbooks to the Harbour Master office. All ships are required to carry certificates that establish their seaworthiness, type of ship, competency of seafarers etc. These certificates are provided by the flag state of the ship and among them are the Oil Record Book and the Garbage Record Book, in compliance with MARPOL (International Convention for the Prevention of Pollution from Ships) requirements. The vessel's logbooks may be inspected by port state control officers in order to ensure that the information contained is accurate, while any discrepancies may trigger a more detailed investigation, vessel detention or even civil/criminal penalties. All entries should identify the person making the record, date and time of recording, position of vessel and evidence of review and endorsement by the Chief Engineer or Master as appropriate (IMO, 2012). The inspection, recording and proper exchange of such information electronically is inherently difficult.

4. CONCLUSIONS - DISCUSSION ON IMPLICATIONS

Despite the development in information and communication technologies and in trade data-exchange standards, the ship, cargo and passenger service processes in many ports remain predominantly paper-based. The development of Port Community Systems has allowed for the seamless exchange of data and information among the port-related actors, implementing in practice the Single Window concept. The deployment of such a system includes more than one evolutionary development stages, starting from an efficient Customs declaration system, electronic payment etc. and reaching to a fully integrated system that incorporates all relevant governmental authorities/agencies and national logistics platforms.

The experience from the ongoing development of the PCS in three Adriatic Ports (Venice in Italy, Ploče in Croatia and Igoumenitsa in Greece) revealed certain barriers, which require effort and time to be overcome, namely the lack of integration of IT systems and of Customs processes, the extraction of usable information from databases and the difficulties in restructuring certain port functions. Concerning port-to-port communication, inefficiencies also occur due to the use of non-uniform documents.

The lack of integration of IT systems has been reported as a common problem in many ports. Port actors generally use IT systems to produce or register the documents, yet certain documents are submitted in such a format that the operator is obliged to manual submission. Although the majority of parties communicate within their organization in electronic form, the information exchange between different parties is many times paper-based as their systems are not interconnected. Gate control is usually based in information provided in paper form. The transmission of the ship's bay plan prior to the actual ship arrival at port is not always utilized by Terminal Operators leading to suboptimal planning of the relevant operations.

The integration of the Customs processes in a Port Community System is the most difficult step as Customs involve paper work in a heterogeneous operating environment with security and safety aspects. An additional difficulty for Customs integration derives from the fact that port customs departments are normally segments of a national customs system that may have its proprietary information system. Nevertheless, other port-related actors would significantly benefit from an accessible database containing valuable customs documents and the corresponding clearances. Customs (also Port Security agencies) can extract useful information from the ship's passenger list and cargo manifest for trucks. Although this process would positively impact the port operations, it cannot be compulsorily put into effect as it may have implications on the workload and the complexity of reporting formalities for all involved parties.

Certain port functions require a radical restructuring in order to become operating elements of the Port Community System. The intricacies related to Gate Control procedures and to Harbour Master checks are two characteristic examples. Regarding the former inefficiency, the port authority's approach to a potential solution would require the involvement of truck drivers: informing the drivers about the readiness of their cargoes would allow them to plan their trips to port in time, avoiding unnecessary waiting time and congestion inside or outside the port's area. Furthermore, the inspections performed by the Harbour Master cannot be easily automated, as they normally require physical appearance on the ship or the manual submission of the ship's logbooks to the Harbour Master office.

Regardless the difficulties mentioned above, the widely recognised benefits of the Port Community Systems in terms of harmonization and standardization of business, reduction of paperwork, time savings and errorless environment, will boost the transformation of conventional port systems to advanced port communities both locally and internationally by use of communication platforms (Single Window systems) exchanging information among the interconnected ports.

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