Title Ideal Port I

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1. Introduction

This paper is written as basis for preparing a project proposal seeking funds to revolutionise port operations. This paper only includes information about port operations and does not include sensitive information about the proposal overall. Parts Ideal Port II and III of the paper will be publish after this intended proposal is successfully carried out.

Acknowledgement – part of this paper is based on an earlier paper by Yavus Keceli (2011).

1.1 Objectives

The specific objectives of IdealPort are based on the analysis of the current situation and needs for new technologies for maritime traffic and port management (Ziarati et al, 2013). This project proposes to learn from the good aspects of key major and efficient ports and inland waterways and integrate the port operation in a novel way putting more emphasis on Port/waterway Community System and link port/water operations with navigation system, Vessel Traffic Services and propulsion system with a view to improve safety and security of shipping and reducing costs of port operations, fuel consumption and Green House Gases (GHGs).

As stated in the Call for Action documents, enhanced or new technologies for maritime traffic management is seen as a key for safer and more secure operations as well as to lower emissions, whilst supporting a more competitive maritime transport as part of an integrated transport chain; particularly the need to reduce congestion in ports and port fairways requiring the port traffic guidance systems to be at the same time cost efficient and easily deployable. Therefore, IdealPort proposes to activate ICT systems in order to improve the use of port traffic guidance tools by all relevant authorities.

The European Union has introduced a number of regulations and recommendations aimed at considerably improving port operation and maritime security. These regulations are based on and complement the requirements of the International Maritime Organization (IMO), European Maritime Safety Agency (EMSA) and European Agency for the Management of Operational Cooperation at the External Borders of the Member States of the European Union (FRONTEX). These are documented in International Management Standards (IMS), the International Treaty for the Safety of Lives at Sea (SOLAS), International Convention for the Prevention of Pollution from Ships (MARPOL) and the International Ship and Port Facility Security (ISPS) Code (Regulation XI-2/3, 2004 and EU Regulation (EC) 725/2004).

The foundations of the regulations and recommendations are based on the obstacles observed with regards to the integration of maritime surveillance and are stated in COM(2009)538 with the title “Towards the integration of maritime surveillance: A common information sharing

environment for the EU maritime domain". IdealPort proposes to offer an integrated system to overcome the obstacles stated by the European Commission.

The main obstacles to the creation of a common information sharing environment are stated as follows:
(http://europa.eu/legislation_summaries/maritime_affairs_and_fisheries/maritime_affairs/pe0011_en.htm)

- diverse user and operator communities
- diverse legal frameworks
- cross border threats
- specific legal provisions

IdealPort proposal realizes the obstacles and generates its actions in consideration of the solutions foreseen by the EC:)
(http://europa.eu/legislation_summaries/maritime_affairs_and_fisheries/maritime_affairs/pe0011_en.htm)

Solutions for the integration of maritime surveillance

The creation of a common information sharing environment is based on compliance with the following Guiding Principles:

- optimising the exchange of information between the different user communities
- building a non-hierarchical technical framework of maritime monitoring and surveillance systems.
- exchanging information between civilian and military authorities.
- removing obstacles to the exchange of information imposed by specific legal provisions**.**

The main aim of this project is primarily based on safer shipping, safety devices, surveillance, monitoring and integrated management of waterborne transport, European GNSS-based procedures for port approach, pilotage and guidance and traffic management. The core work packages will concerned the following:

- ✓ Integrated VTS and PMIS solution, including data exchange between ship-to-shore for the purposes of increasing the safety, automation of port and terminal activities and traffic management based on e-navigation concept.

- ✓ Intelligent Traffic and Port management shall use the means of VTS and PMIS for creating intelligent traffic management. For example, "developing a rule based (VTS/Port Authority Rules) and real time data based decision-support module, receiving the reports of the ships approaching a VTS area (port, channel, etc.), putting the ships in a queue for port operations or anchoring or transit passage automatically" and "developing decision support system for optimal management of berth space and timings for ports via keeping track of planned vessels' arrivals and departures on berths, scheduling and managing vessels' berth positions by solving assignment problem considering vessel and port constraints/requirements" will decrease the costs of ship operations, since human factor for planning shall be reduced.

- ✓ 3D Modelling of ships and ports to increase the visibility, maritime safety and efficiency of port operations.
- ✓ Integrated PMIS applications such as vessel call, Berth Management, Pilot Management, Tug Management, Port Services Management, Agent Access Management, Reporting & Dashboard, master data management, etc. The application will be available in cloud/web based software to reduce the operational costs of the ports. As the cloud applications are very popular nowadays, the proposed technical solution will also meet this expectation.
- ✓ Port Community System development and implementation to enhance the integration and communication between the all share holders of a port with means of safety and security.

The intention of this project also to review the existing arrangement for navigation on board vessels and consider a possibility of integrating the outputs of port operations and ship navigation and key engine controls and develop an intelligent management system which helps to improve the communication between the post and the ship primarily to make port-ship operations more effective and more efficient. The proposed integrated system would help to reduce energy consumption and engine emission to minimum in ports and waterways as the intention is to ensure IdealPort complies with IMO's EEDI. It is also intended to develop means of monitoring the emissions at ports in accordance with EEDI.

1.2 Relation to the work programme

IdealPort proposal is relevant to the three main challenges of the work programme topic, with special impact on ensuring synergies with existing systems, with the aim of integrating the use of port traffic guidance tools by all relevant authorities and ensuring the full interoperability between Information and Communication Technologies (ICT) systems, which monitor vessels, freight and port services.

1.3 Concept and approach

The overall concept underpinning the project is based on the developments regarding maritime safety requirements. The reports published by maritime communities, such as Lloyd's Register, IMO and European Commission has been looked into in the process of preparing the IdealPort proposal. A review of recent publications (Lloyd's Register, Life Matters, June 2012) and IMO's own reports (Marine Environmental Protection Committee (MEPC), 64 session, Agenda item 4, 29th June 2012) and similar reports by learnt society and classification society and maritime organisations, for instance, German Lloyd Academy (GL, EEDI in practice, 2012) give a clear view of the road map for making ports safer, cleaner and more secure. The whole of Central and North America coastal areas are now almost an ECA (Emission Control Area) and it is expected that coasts of Mexico, coasts of Alaska and Great lakes, Singapore, Hong kong, Korea, Australia, Black Sea, Mediterranean Sea and Tokyo bay are currently considering to become ECAs. What is significant is the shipping routes which 90% of which goes through these areas so the implications are serious.

The project will include existing arrangement for navigation on board vessels and consider the possibility of integrating the outputs of port operations and ship navigation and key engine controls and develop an intelligent management system which helps to improve the communication between the port and the ship primarily to make port-ship operations more

effective and more efficient. The proposed integrated system would also help to reduce accidents in close quarters such as port and inland water ways.

The positioning of the project

The initial phase of IdealPort applies the notion of "idea to application" as in terms of Technology Readiness Level, the technology concept has been formulated (TRL 2). Throughout the implementation process, the technology concept will be realized, tested and applied in relevant environment. In other words, steps TRL 5 (technology validated in relevant environment), TRL 6 (technology demonstrated in relevant environment), TRL 7 (system prototype demonstration in operational environment), TRL 8 (system complete and qualified) and TRL 9 (actual system proven in operational environment) will be followed throughout the implementation process.

Therefore, in terms of positioning of the project, IdealPort proposes to start from the "idea to application" stage and move on to "lab to market" stage during the implementation period, resulting in a monitoring system provided for maritime traffic management which can be used by ports in order to extend, integrate and optimise waterborne transport information and communication systems with the aim of contributing to build a comprehensive "e-maritime" environment.

Links to the National and International Research and Innovation Activities

IdealPort project has built a consortium of universities, ports and shipping companies in EU member states and Turkey with the support of a strong steering committee. The consortium is a combination of experience and expertise in the maritime sector ranging from academic research, maritime traffic management, port management as well as ICT systems. As summarised the consortium studied all current national, European and international relevant research and legislations. This project has also studied included recent EU work with regard to TEN-T programme and has ensures that it complements the programme and in the process would ensure that ports in Turkey would also be in the position to take advantage of the programme and get ready for integrating their operation with other ports in Europe.

VTEK, the project coordinator for IdealPort, specialises in Port applications, RFID applications as well as Management and IT systems. In terms of port management systems, VTEK is one of the leading businesses in Turkey with V-Port Port Management Information System. V-Vessel, one of the programmes prepared for port management by VTEK, encompasses the complete activities of the ship management from loading to discharge and the infrastructure of the module enables the user to manage the complete range of services in an accurate, timely, fast and uninterrupted manner. The module controls every phase of the operational activities both automatically and manually in a dynamic manner.

VTEK will be supported by Bahecesehir University (BAU) which is Turkey's first and the only maritime university and by C4FF of the UK who have managed many major international projects including EU and EUREKA funded projects. It is pertinent to note that BAU is established by the shipping community in Turkey and have access to all maritime facilities including ports in Turkey. TRANSAS which is one of the key technological partners of this consortium will support both VTEK and C4FF. The systems will be installed in pilot port (in Turkey with support from Port in Malta, UK and Finland) for demonstration. Any new system will be considered for evaluation and testing in any of the other partner ports.

The shipping company, MakroShipping, will support the implementation of the shipping side of the e-navigation and ship-to-port-to-ship reporting functions. The partnership will be supported by Regs4ships which is an SME is a specialist in compliance and safety management systems on ships and in ports and operates databases of maritime regulations. The company provides software and intelligent management solutions and management-level training covering the safety of navigation, port management and in particular MARPOL issues such as the IMO EEDI and SEEMP requirements. The Regs4ship will be working closely with Harwich Haven port authority which is a major pilotage authority covering for example the port of Felixstowe. The Port of Felixstowe is Britain's biggest and busiest container port, and one of the largest in Europe. The pilot centre in Malta will provide the pilotage issues in ports. The maritime university in Poland has close working relationship with ports and waterways in Poland. They will work very closely with other maritime universities in the consortium. The partners will be supported by the formidable members of steering committee which is expected to provide guidance when needed. There will be more about the partnership in Stage 2.

On the other hand, V-port is the only software available in the market enabling the user to monitor real-time activities within the port at any given time in a 3D format visually. Such a tool permits the user to carry out management functions in an efficient and accurate manner, eliminating the risks of mismanagement which would have inevitable consequences of unhealthy assumptions and faulty imagining of the actual situation. The most fundamental advantage of the module is that it empowers the user with flexibility and that it facilitates the identification of bottle necks at early stages which creates the users ample opportunity to manoeuvre. (www.vtek.com.tr)

The project coordinator will be sharing the know-how of the information systems based on the results obtained via the needs analysis work package in IdealPort. The work package for needs analysis will bring together the knowledge and experience of the ports and universities which are taking part in the IdealPort partnership structure and the advisory committee.
In terms of clarifying the strengths of the partnership structure of IdealPort, a couple of examples have been provided based on the background of partners and the projects they have been implementing. C4FF (Centre for Factories of the Future) has been implementing many EU funded projects, specialising in generating ICT systems for the maritime sector. One of the projects that are currently ongoing is METPROM - Modular Enhanced Training Programme for European Maritime Security Personnel. METPROM is intended to develop and transfer innovations for maritime security training and simulation based modules to fill security gaps in increasingly complex operational activities in ports which are vital for the timely conduct of shipping and support more than 90 % of world trade. METPROM is also intended to bring EU wide standards to the port security procedures e.g. through standardized and harmonized training programs in partner countries. New courses are planned under the project including a new course in port security incorporating novel, simulation-based modules utilizing game-based technology, 3D models, and adaptation of an e-learning platform with assessment facilities. (http://www.metprom.eu).

Another project that is currently running is EU funded ACTS (Avoiding Collisions aT Sea), supported by Piri Reis Univesity. This project focuses on testing and transferring several new skills into existing MET programmes and common methods and systems for their deliveries. The main tangible outcome is an online and novel learning and assessment platform facilitating inclusion of the identified new skills in existing maritime programmes and the correct application of Colregs, which is expected to lead to a reduction in the number of accidents at sea. The project impact will be substantial as it concerns the training of all

navigation cadets and officers/ratings already working in the sector. (http://www.ecolregs.com). Partners such as C4FF, Satakunta University, Piri Reis University have been leading several projects studying previous accidents at sea and ports (for instance www.marider.pro. www.surpass.pro). The outcome of these will be taken into consideration when implementing this project.

Malta Maritime Pilots, one of the partners of IdealPort from Malta, is another experienced institution with regards to pilotage and port management systems. Also from Malta, the partnership of Malta Freeport provides one of the necessary environments to analyse the needs for the port management systems. Partnerships with ports and maritime pilots is accepted as vital to the success of IdealPort as they will be of essential assistance in the process of carrying the proposed ICT system for port management from "idea to application", provide feedback important for improving the system as well as supporting the process of "lab to market".

The expertise of Transas is also deemed important for the IdealPort project as Transas will be bringing in their know-how with regards to port and vessel traffic management solutions, simulations as well as use of high-end technology. Transas products include integrated onboard and onshore systems, marine and aviation equipment, flight simulators and training devices, safety systems, geo-information systems, unmanned air and floating vehicles, solutions for education. This partner has the capability of modelling ships and the ports as 3D, thus increasing the visibility and safety of activities. (https://www.youtube.com/watch?v=bYU_M95_RIA).

Port of Rauma and Satakunta University of Applied Sciences from Finland are yet other partners vital for the identification of needs, devising methods, analysing port-ship communications as well as the testing process of the port management system proposed by IdealPort project.

Research and innovation comprises utmost importance for achieving the intended objective of IdealPort project. As the aim is to enhance maritime management to result in safer and more secure operations while ensuring cost efficient and easily deployable port traffic guidance systems, the IdealPort consortium has devised the following Work Packages to be implemented.

WP 1 – Management

WP 2 – Identification of needs and methods

WP 3 – Ship-Port-Ship Communications

WP 4 – IdealPort Online Platform

WP 5 – Testing and Validation

WP 6 – Valorisation (Dissemination and Exploitation)

WP 7 – Post-funding Arrangements and IPR

The overall approach and methodology

The information systems used in port operations have three major functionalities, as shown in Figure 1.

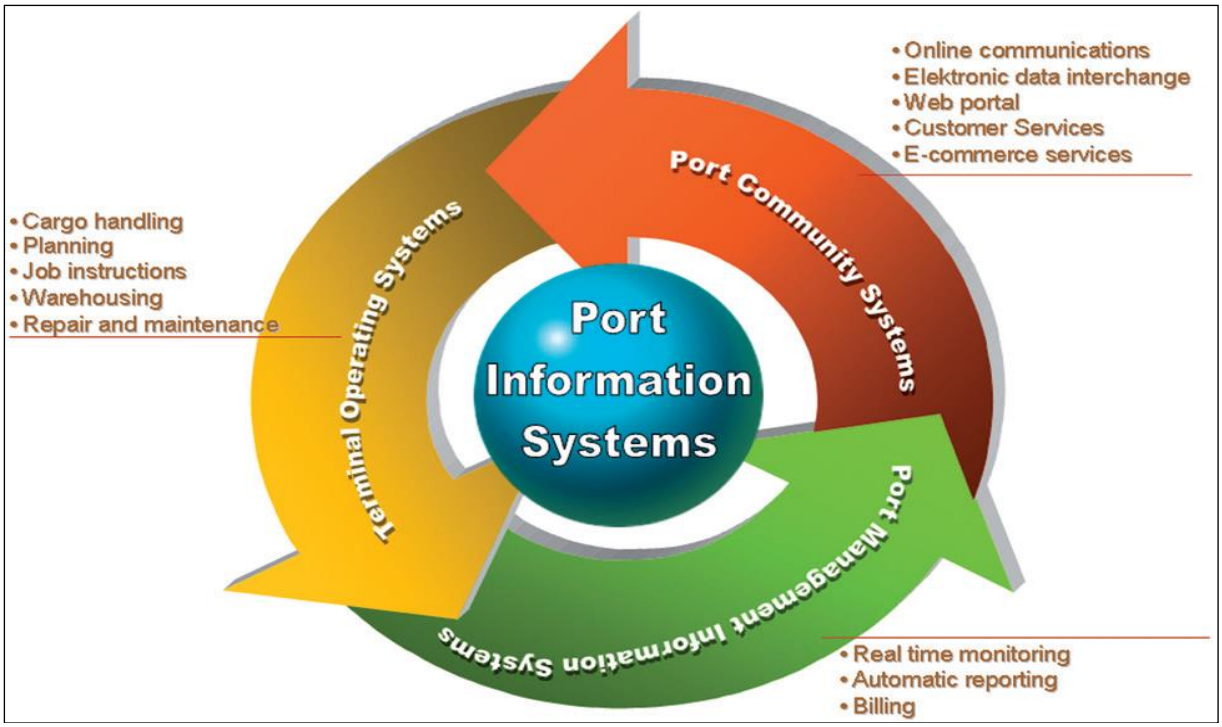

Figure 1 - Information systems used in port operations

Terminal Operating Systems (TOSs) are 'computer systems available for organizing the container terminal itself' [4]. These systems generally provide features related to the physical handling of cargo within the terminal area, such as planning, operation control, job instructions for equipments, etc. On the other hand, Port Management Information Systems (PMIS) generally provide the upper management with features to monitor and control the overall port activities and other managerial functions, such as billing, automatic reporting, etc.

The main aim of the IdealPort Project is to take account of existing good practices and knowledge for port management and operation, develop a details set of processes and procedures for ideal port operation and then develop a Port AutoPilot (an online and integrated software platform) integrating all aspects of four identified stages of ship-port operation in order to improve safety and to reduce wasted effort of applying discrete and separate operations as well as filling the security gaps created as the result of increased complex operational activities in ports, which are vital for the timely conduct of shipping that more than 90 % of the world trade depend on. The concept of ports is extended to waterway and the same principle will be used to manage inland waters and rivers and ensure a greater safety and security in these waterways.

Current port operations are shown in the following Figure (Figure 2).

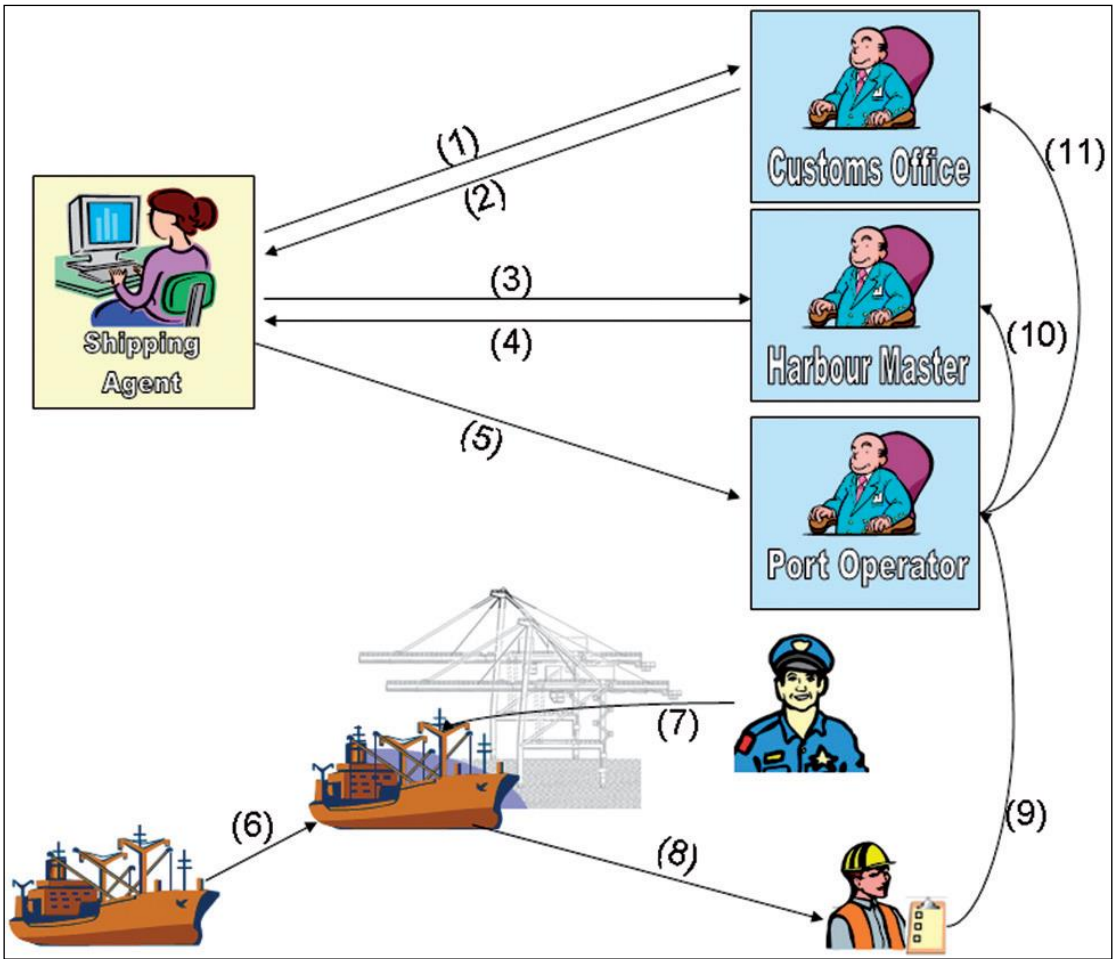

Figure 2 - Summary of current situation

IdealPort proposes a three-stage transformation strategy for EU maritime community, as shown in Figure 3. The proposed system is then integrated with ship operations, safety and security.

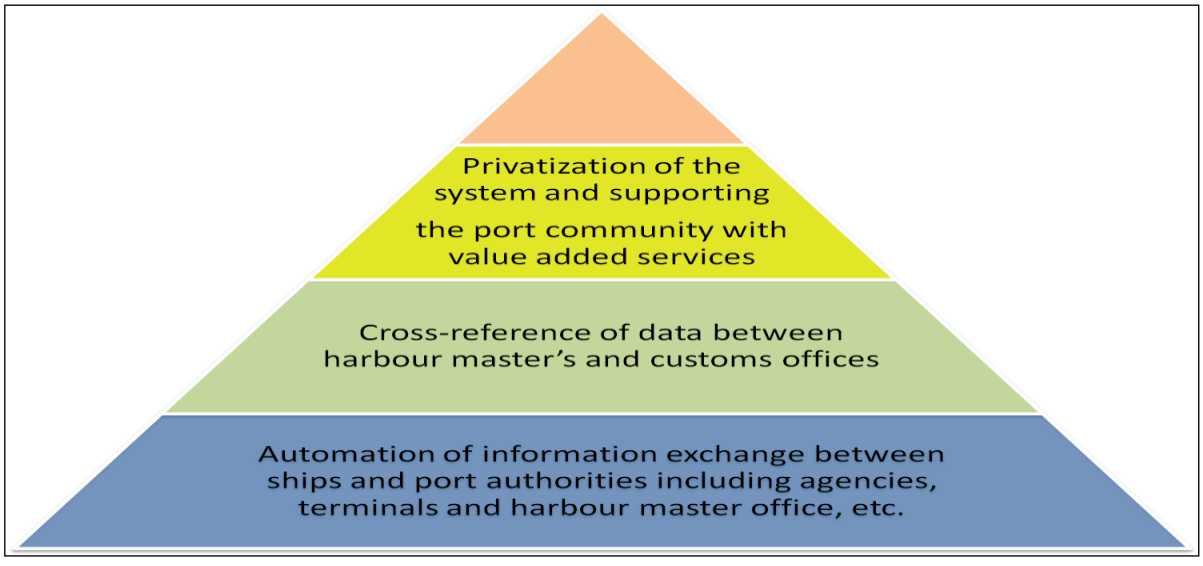

Figure 3 - Proposed PCS Development Strategy: First stage: automation of information transfer between the port operators and the harbour master's office

The proposed 3-stage system aims to enhance communication as well as improve the existing system with the ambition to achieve significant improvements in terms of navigational safety, security and efficiency along the entire waterborne transport logistic chain as well as decrease administrative burdens. ICT systems play an important role in the implementation of IdealPort project therefore the partnership structure and the steering committee plays an important role in the realization and testing of the proposed 3-stage PCS development strategy.

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The second aim is to bring EU wide standards to the port operations and security procedures through standardized and harmonized set of processes and procedures applied in ports and transfer the knowledge Europe-wide. In order to fulfil these aims and ensure the project sustainability there are provisions for pilot site demonstration and training of port personnel as an example for all EU Member States to consider and apply. The Impact is expected to be substantial and the proposed Port AutoPilot will help uniformity in EU port operations and security and will enhanced port operation standards.

There are no ethical or gender issues in this project.

1.4 Ambition

The Advance the proposal would provide beyond the state-of-the-art

The innovation potential

Port Community Systems (PCS) are ‘computer networks which link up the port with all the companies that use it, including hauliers, rail companies, shipping lines, feeder ports, shippers and customs officers’. Such systems can be distinct systems or different modules in one integrated system, depending on the organizational structure of the port.

The traditional way of handling port-related documents such as cargo-related documents and forms for port service requests is through paper-based methods, i.e. sending a fax or handing in the documents directly. As a result of diffusion of the internet, sending the documents via e-mail has also become a common practice. On the other hand, the information delivered in such ways must be re-typed into the port’s information systems, which is time consuming and vulnerable to typing errors. In this proposal various PCSs in different part of the work have been reviewed and good aspects of each have been identified.

For instance Portnet in Port of Singapore is the one that is most studied. Port of Singapore Authority’s (PSA) Portnet is the representative PCS since it is totally connected to PSA’s terminal operating system (CITOS) and custom declaration system (TradeXchange) of Singapore government. Portnet provides integrated services to shipping lines, haulers, freight

forwarders, shippers and local government agencies operating in Singapore via internet environment. The system enables online ordering of services, document submission, tracking and tracing the location and the status of their cargo and orders, submission of legal or regulatory documents, easy-access data repository to share critical coordination data and financial functions. Besides Portnet, Data Communications System (Dakosy) and COAST (Container Authorization System) of Port of Hamburg, Customer Plus Programme and OnePort Ltd. and Tradelink of Port of Hong Kong, PortofRotterdam.com, Virtual Port and WebJonas of Port of Rotterdam, PORT-MIS and KTNET in Busan Port can be considered as some of the well-known PCSs around the world.

IdealPort has learnt from the port operation of several advance and efficient ports around the world and is proposing to bring the good attributes of these ports into the IdealPort concept. For instance, Port of Hamburg's data communications system (DAKOSY) links port operations to the operations of logistics companies within the port. It was established in 1982 and was selected as the world's top transport-related EDI system by International Federation of Port Cargo Distributors. Today DAKOSY is the 'single window' of the Port of Hamburg, providing various service applications for import and export, freight forwarding, customs handling, carrier handling and dangerous goods. Dakosy not only enables a single window for the 'paperless port' of Hamburg, but also offers conversion and validation of information besides purely storing and forwarding. For example, inputted addresses can be automatically checked up in the boycott lists and relevant measures are automatically taken when there is a match. The container information system, called COAST (Container Authorisation System) offers online information about status, location and condition of container via user-friendly internet.

The intention of IdealPort is to enable better monitoring of ship-port interactions, freight flows, and combat irregularities including smuggling and to respond adequately to the threat of terrorist attacks. Today, many port facilities have to be compliant with all aspects of port operations and abide by IMO and EU rules and regulations. The overall process is inextricably linked to the establishment and maintenance of certain standards for the organization of their effective and efficient operation including security. Many operations of all aspects have been improved, such as electronic/architectural measures, but there has been not attempt to integrate all related port operations.

In order to reach the intended outcome, a plan of "Four Stages of Port Operations" is to be implemented. Stage 1 consists of all activities related to ships, of various flags, approaching a port when all administration aspects should be proactively prepared. Stage 2 commences when ships enter the port and while there, the process needs to be automated and integrated with stage 1 activities.

The proposed PCS is connected to ports' TOSs with and API, whereas government officers and customers can access the system through a graphical user interface (GUI), such as a web browser, as illustrated in Figure 4. The customers can log in their request through internet (1) and these requests can be transferred to the TOS of the corresponding terminal (2). On the basis of these requests, terminals can perform their operational planning and send job instructions to the equipment (3). In other words, the terminal cannot perform any operation for any request without the confirmation of the harbour master's office. Upon completion of each task, the equipment sends reports to TOS (4) which are transferred to PCS (5). By this way, harbour master's office can maintain reliable statistical data which are obtained directly from the source where the data are created. The status of their cargo can be sent to the customers through a web portal or e-mail (6). Finally, the certifications and the legal requirements of the ships and the crew can be checked

within the terminal area and logged into TOS via a hand terminal (7) and passed to the harbour master's office (5). The surveyors may go and check the ship when necessary. In order to protect the privacy issues, the system does not necessarily cover any function related to the business relations (such as pricing) between the terminal operators and their customers. The information transfer is restricted to those which port operators are already supposed to report to the harbour master's office. Implementation of such a TOS would increase the efficiency of individual port and terminal operators, and thus contribute to the international competitiveness of the ports.

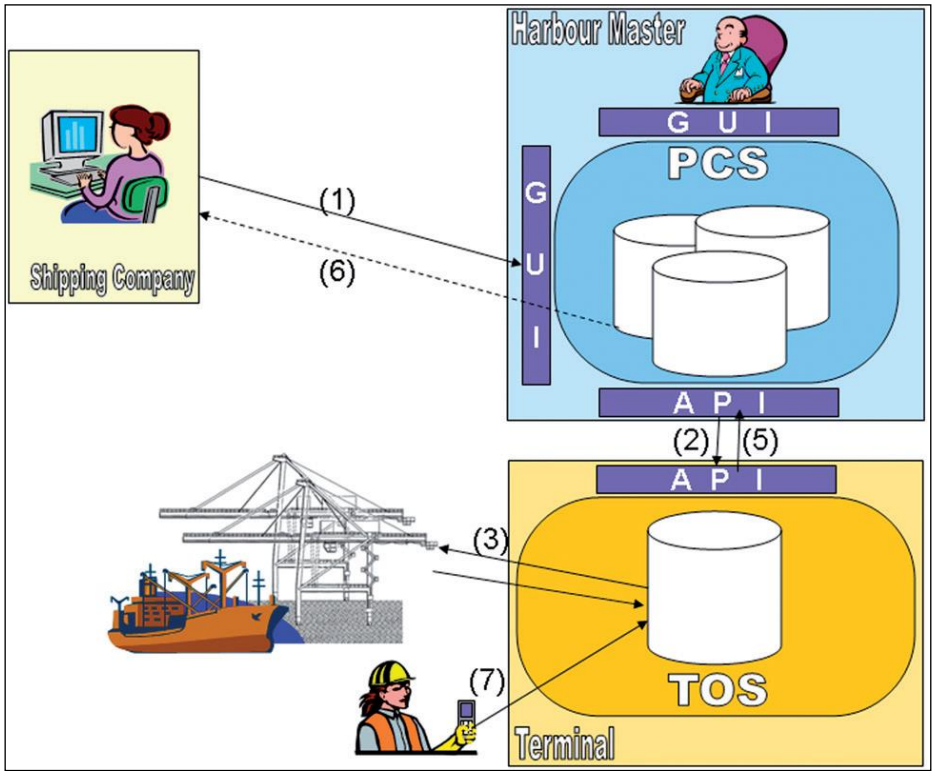

Figure 4 - Phase 1

The second stage, cross-reference of data between the harbour masters and custom office, is relatively more difficult to implement since neither the harbour masters nor the customs office have jurisdiction on the other. In this stage, an API would be provided between the databases of the harbour master's office and the customs office in order to check any inconsistencies in the data submitted by the shipping companies, as shown in Figure 5. These inconsistencies may be intentional or accidental. In any case, when there is any inconsistency, the customs enforcement officers or port state surveyors may directly visit the ship for verification. Thus, limited number of personnel can be used more efficiently by focusing on the suspicious ships.

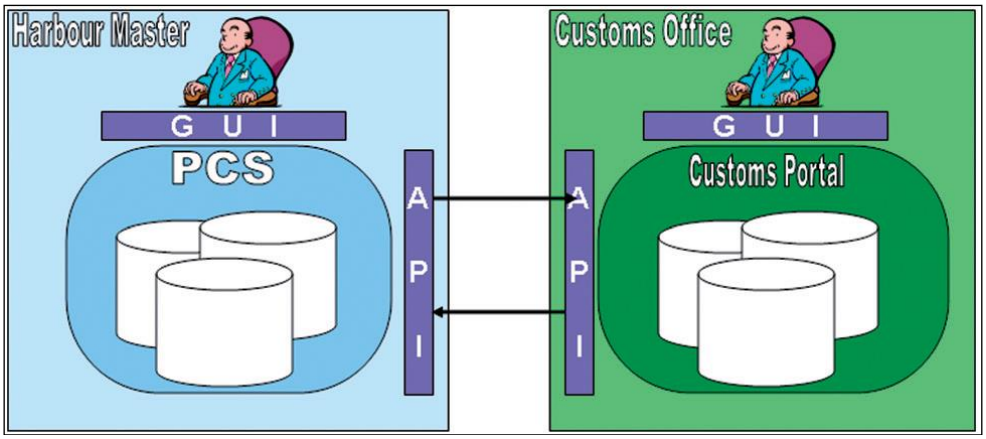

Figure 5. Phase 2

The third stage is when the ship is leaving the port; this is when all paperwork needs to be in place and all security issues have also been dealt with. Stage 4 is when the ship is at sea and there is record of its passage and cargo details are transmitted (to the ports on route and) to the destination port. The Port operation concept is extended to inland water such as each region of the waterway or rivers are seen as ports using a VTS concept. The accidents are avoided by better management of incoming and outgoing vessels from ports or segments of the waterway, using electronic guidance system, known here as AutoSet, a sea-ship autopilot system.

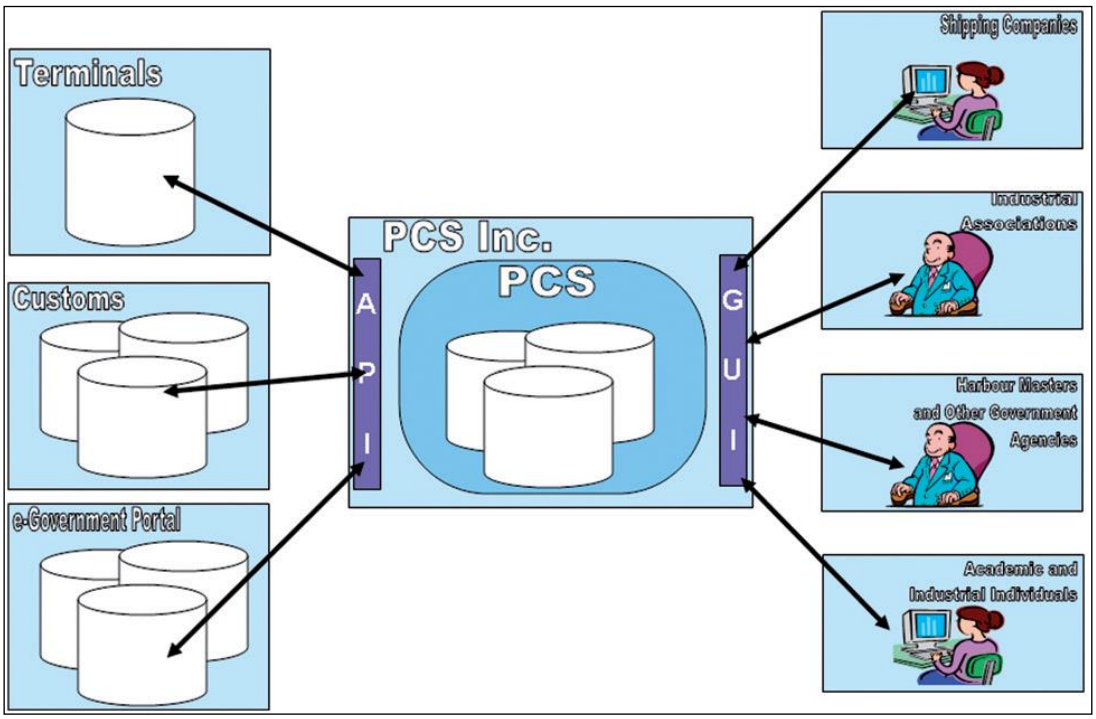

Figure 6 - Phase 3

The involvement of the private companies (i.e. the port customers) in the system should be left to the final stage, as given in Figure 6. There are several reasons for this. There are several published cases indicating that private companies may resist changing the type of business they are used to do, and refuse to use such a system until they perceive the benefits of the new system. Keceli et al suggest (2011) that user acceptance of PCSs directly depends on the support of the user company's top management and the technical reliability of the

system. Thus, the involvement of the users before the maturity of the system may cause failure. It is suggested that user acceptance of PCSs directly depends on the support of the user company's top management and the technical reliability of the system. Solely the maturity of the system is not sufficient. The governmental agencies must provide good public relations with the industrial companies, such as providing training programmes, seminars and incentives to ensure that the benefits of the new system are well perceived by the users.

Since it is not very practical for a governmental institute to provide commercial services, privatization of the system may contribute significantly to the efficiency of operations, quality of the services provided, and the acceptance of the system by the members of the port community. On the other hand, security and the control of the activities must be ensured by the government. It is the best practice to operate a PCS by an independent corporation for commercial flexibility. System being first implemented by government and government supervision after the privatization can assure the trust of the customers needed for private sector participation.

Furthermore, IdealPort project proposes to bring an additional value to the port management systems through the involvement of maritime private port and security guards who are somehow positioned outside of the scope of national private security legislation, which CoESS (Confederation of European Security Services) believes to be an alarming trend. This situation has the risk of causing dramatic decrease in the training standards of private security staff in ISPS-compliant and EC 725/2004 compliant areas. Therefore, the involvement of maritime private port and security guards will improve the security of ports in a sustainable way.

2. Impact

2.1 Expected impacts

Based on the topic of "Safer and more efficient waterborne operations through new technologies and smarter traffic management", IdealPort proposes to address and create impacts on the following challenges;

- For traffic management, solutions that support the extension, integration and optimisation of waterborne transport information and communication systems with the aim of contributing to build a comprehensive "e-maritime" environment (including e-Navigation components that are compatible with existing or emerging international standards). They should serve the overall objective of building the European Maritime Transport Space without Barriers allowing waterborne transport (including inland navigation) to be used to the full potential of the integrated intermodal logistic chain. Solutions should also provide the foundation for the deployment of autonomous and actively guided ships as well as the possibility to verify all related safety certificates before the vessel enters the port.

- New and improved systems for the surveillance, monitoring and integrated management of waterborne transport and other activities (commercial and non-commercial).

The expected benefits of the proposed system by IdealPort are summarized below:

Performance

Fast access to information: Any concerned company, being public, private or academic, can easily access digitally stored information which cannot be accessed when it is on paper. Access to such information is essential for planning and research purposes.
Efficient use of limited human resources: Online retrieval and analysis of information makes it easier to conduct the tasks. Thus, more tasks can be achieved by less manpower. This opportunity helps the public authorities to overcome the problems of limited human resources.
Strengthened control and enforcement mechanism: When the processed data are automatically checked for any legal or economic reasons of detention, the surveying procedures would be more accurate compared to checking manually.
A Comprehensive Support Decision System: Fully integrated, automated and served data for the end users shall provide an efficient decision support tool for all kind of port operations. The system can also automatically trigger alerts for those ships and cargo to be surveyed and the probability of missing suspicious declarations could be lowered significantly.
Safer waterways: IdealPort also aims to develop some new VTS tools for traffic management for safer Marine Electronic Highways.

Information quality

Access to information directly from its source: Current system depends on the paper-based declarations of the customers and terminal operators about the cargo handling and ship berthing statistics. These declarations are subject to Innovation strategy for port administration policy human errors, intentional wrong declarations or time delays. If there is a link established between the TOSs and harbour master's office, reliable data can be directly obtained from the source of the data (i.e. berth, yard, gate, etc.) on real-time basis.
Decreased rates of human errors: Information typed into any computer system via keystrokes is inevitably subject to human errors. Thus, the number of such mistakes can be significantly reduced by the reduced number of human intervention in the system.
Decreased rates of inconsistency: Since the information is no longer submitted manually to each interested party (i.e. harbour master's office, customs, chamber of trade, etc.), the statistical figures obtained from different sources are supposed to be more reliable and consistent with each other.
More quality information for decision support: Data stored on paper are not suitable for analysis. Thus, the proposed system can provide a basis for other decision support systems to be implemented to guide port management.
Recognizing unforeseen relations: There are several analytical methods (such as data mining) to derive unforeseen relations and patterns among data applicable to the row data obtained by the proposed system to derive further valuable information, knowledge and patterns for planning, strategy, security and research purposes.
Provide reliable data for future investments, projects and research: Increased quality and consistency of data will certainly affect the success of any investment, project or research that relies on it, and reduce the risks involved.

Economic benefits

Decreased cost of information access: Online access to timely and reliable data via internet is definitely cheaper than the efforts to gain similar information on paper by physically going to the place where the information is archived. Here, the word 'cheaper' refers to the time lost as well as the money spent.

Decreased communication costs for shipping companies: Submitting the documents on paper involves some costs including fax, stationary (paper, toner, etc.) and labour. These costs can be decreased by using PCSs, provided that broadband internet is already installed in the offices. For example, the use of paper and toner can be significantly reduced as well as number of employees can be decreased due to the decrease in time consumed for the same amount of work.
Extra income for government: Since the customers are willing to pay a reasonable fee for the services offered, PCSs can be considered as a new source for revenue generation. It must be noted that PCS fees can be considered as reasonable when the amount of money paid by the customers is less than what they used to pay for same tasks, such as fax, stationary, fuel, time and labour.
Correct taxation and prevention of smuggling: The proposed system can automatically cross-reference data submitted by the shipping companies with actual cargo handled at the terminals in order to detect any inconsistency. Thus, tax frauds and smuggling can be avoided more efficiently.
Prevention of illegal income (i.e. bribery): Making systems more 'human independent' helps to prevent the illegal activities of corrupt personnel.

International competitiveness

International access to online information via internet: In today's global economy, enabling document submission via internet not only makes the tasks of the local shipping companies easier, but also attracts the concern of foreign shipping companies as well.
Increased international competitiveness of ports: Along with the other benefits described, a PCS would definitely contribute to the competitive power of ports against those not benefiting from the opportunities provided via ICT systems.

Expected increase in the number of foreign ships calling at ports for transhipment: Increased level of information technologies utilized in the port would result in decreased service times, which are two of the factors that affect port selection. This factor is more important for transhipment cargo, since inbound and outbound cargo somehow depend on the capacity of the national economy. Thus, increased number of ships calling at IdealPorts not only contributes to the profitability of the ports, but also supports a competitive market.
Full conformity to international security standards: Implementation of a PCS is expected to have positive impact on the improvement of business processes applied in the ports, both public and private.

Efficiency of terminal operations

Incentives and support for implementation of TOSs in accordance with the prospective PCS: Implementation of nationwide PCS would force the private port owners and terminal operators to develop and implement a minimum level of TOS that stores and submits the operational data to the system. Thus the implementation of the PCS would be a stimulating force for the terminals to upgrade their operational systems. But this upgrading process can lead to economic burdens and technical conflicts especially for the small scale ports and terminal, where government support and guidance is needed.

Increased level of operational standards and efficiency within individual terminals: Along with the stimulating effect of PCS on the usage of information technology within the terminal area, the efficiency of the basic port operations, such as loading, unloading, stacking, etc. is also expected to increase. The improvements of such key performance indicators of

each terminal within the ports would significantly contribute to the competitiveness of the whole port industry.

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