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Abstract

Nowadays, rapid technological development leading businesses, in order to make them viable and attractive on products and services, to the adoption of innovative technologies. Especially in the maritime sector, the companies operating in it to stabilize their activity and meet the modern demands of international shipping environment resorting to the use and implementation of new information systems The objective purpose is to upgrade the existing digital services and the implementation of new innovative ones, to provide better and more secure collaboration between all traders, private and non-actors at national and international level.

With this paper we will talk extensively about the efficiency of digital services as well as whether they find suitable ground in Greece. The importance of ICTs (Information and Communications Technologies) in facilitating trade and their contribution to strengthening the country's economy making it more attractive and competitive. Of course, in order to create the framework in which all these processes will take place, to ensure the smooth movement of goods, the exchange of information and generally anything of facilitating the work of shipping companies, it is essential the customs contribution.

Customs through their electronic services seeks to create a secure environment that will provide businesses with flexibility and speed in the movement of their products. The application of specific information systems and their rational use is aimed at strengthening such a framework with multiple benefits for shipping companies and for our national economy.

An integral part of the development of the shipping sector is also the ports. All shipments, cargo movements take place at port facilities, so the ability of each port in fast-moving products plays a decisive role. The use and the implementation of new and innovative technologies in ports will give impetus for greater development in order to respond positively to the modern requirements presented in the international maritime environment.

Beyond that we will refer to any malfunctions that may arise during the implementation of new information systems as well as the existing IT systems as to their compatibility and effectiveness.

Moreover, through the conclusions that will be drawn, we are given the opportunity to propose some possible interventions with the aim of assimilating as much as possible new technologies.

Keywords: e-Customs, Information Communications Technologies (ICTs), Information Technology (IT) systems, European Union (EU), European Commission (EC), Member States, Multi-Annual Strategic Plan (MASP), digital Technologies, ports, port services, Port Community Systems(PCS), Terminal Operating Systems (TOS).

Table of Contents

Table of Figures

CHAPTER 1

1. Introduction

The exploitation of digital technologies constitutes basic core of transformation and growth of countries. However, the strategy that each country selects for her digital transformation differs. Basic factors for the choice of suitable digital strategy constitute the particular characteristic and possible points of each country, the level of digital maturity as well as the wider tendencies that influence the economies globally, in local and world level.[1]

Decisive role in the effort to the growth and use new digital technologies, constitutes the European Union. Specifically, the European Committee having as a main objective "the customs union of all its Members-States", through the development of E-customs, invests in innovative digital technologies. The ultimate goal it is to create a more efficient and modern customs environment, which will provide a consistent basis for economic integration and development of Europe.

Figure: 2 Technology and Communication

1. *SEB: H PSIFIAKH ELLADA: O DROMOS PROS THN ANAPTYXI MAIOS 2017*

1.1 Digital development in Greece and the efficiency of digital services

Digital services in Greece show lower penetration and less growth than other European countries. Recent researches show that our country is among the deadlocks in Europe to maturity and exploitation of digital services.

The European Commission has set up a Digital Scorecard and the Index of Digital Economy and Society (DESI)[2] to record the digital performance of its Members-States. The DESI index is composed of a set of qualitative and quantitative sub-indicators and reflects the digital evolution of the 28 Members-States of the European Union.

Figure: 3 digital technologies as a chance to development

Greece in the Digital Economy and Society Index, is one of the last three countries in the EU, behind of sectors such as the use of the Internet and digital services, skills in the use of digital services, digitization of public services, etc.[3]

Moreover, in the digital maturity index of the of Internet economy (e-Intensity[4]), Greece is enlisted also to the last positions of EU (27th place). That fact shows the small contribution of the digital economy in the Greek Gross National Product (GNP).

1.2 The importance of ICTs in facilitating trade and enhancing the competitiveness of the national economy

The competitiveness of economy depends immediately from the processes that are applied as well as by the infrastructures of country. The time-consuming procedures that are required for the transaction of imports and exports of economy in the customs, the incomplete infrastructures in land and marine level (roads, harbours, etc.) as well as unreliable processes of logistics which create fluctuations to

Figure:4 Storck Harbour scene

2 https://ec.europa.eu/digital-single-market/desi
3 http://www.sev.org.gr/vivliothiki-tekmiriosi/erevnes-meletes-2/psifiaki-oikonomia
4 https://www.bcg.com/en-gr/publications/interactives/bcg-e-intensity-index.aspx

the matter of time and the cost of completion of commercial transactions, increase the difficulties for the enterprises of our country to contract international commercial collaborations. The above factors don't encourage the creation of a reliable enterprising environment.[5]

In order to improve its position internationally, Greece has developed studies such as the National Supply Chain Strategy[6] to solve the existing problems and in particular to the facilitation of international trade, has been designed a corresponding National Strategy[7] setting specific targets and sub-actions. A key point in these strategies that being developed, is the vital importance of Information and Communication Technologies (ICTs) in enhancing information between stakeholders at the various stages of the supply chain. In addition, there are specific priorities for integrating ICTs to the logistics processes within companies.

1.3 The impact of digital services on supply chain efficiency

The benefits that digital services provide, are multiple and aim at increasing business efficiency and outreach, improving the functioning of the public sector, increasing public tax revenues and boosting employment. Some important digital services that aim at better management, thorough scrutiny and effective coordination of business and government supply chain activities are:

Figure:5 Supply logistics chain

- E-procurement support services
- Electronic pricing between businesses, organizations, consumers
- Traceability services and systems
- Electronic customs clearance of commercial documents

The benefits of the private sector in particular from the use of digital services are summarized in:

- Increasing the efficiency of the supply chain of Greek companies
- Reduce administrative costs and operating costs in businesses
- Increase staff productivity in supply chain management
- Improve coordination, increase transparency in the supply chain and contribute to combating tax evasion

5 SEB/EPIXEIRISEIS & PSHFIAKI OIKONOMIA/ Nees Thesisς Ergαsίαs Kαliteres Yphresies/2015
6. Ypουργείο Anάptuxhs & Antαgonistikothtas – Ethnικήi strαthgικh gia thn efodiastikh alusida sthn Ellada
7. Ethnική strαthgικh & odikos harths gia th dieukolynsh tou exoterikou emporiou

In addition, digital services in the supply chain also bring significant economic benefits to the public sector. Specifically in Denmark, according to EU estimates partial e-invoicing saves € 150millions for taxpayers annually and for companies € 50millions. Correspondingly, in Italy public e-procurement systems directly saved for public sector expenditure of € 3billions.

Another important aspect of digital services is their ability to better monitor public sector processes, thus contributing to the fight against pathogens, such as tax evasion and smuggling, resulting in the loss of significant public revenues, as well as the unfair competition between undertakings. Indicatively only cigarettes, smuggling in Greece is estimated at 21% of total consumption, resulting in tax revenues of € 700millions up to € 1billions. In this segment, electronic traceability services can improve the level of supply chain monitoring where high rates of smuggling (e.g. tobacco products, fuel and beverages) occur while at the same time increasing public revenues. On the same basis, e-invoicing services, which by enabling the limitation of counterfeit and virtual tax information, contribute decisively to combating of tax evasion.[8]

1.4 The Multi-Annual-Strategic-Plan (MASP) project in the creation and evolution of electronic customs

The electronic custom constitute important initiative and progress for the customs union of EU. This project, pioneer of which is the European Commission, aims in the replacement of customs processes in form of paper with electronic procedures, creating a more effective and modern customs environment. The prospect of this work, which will benefit so much the enterprises and the citizens too, is moved in two axes:

- In the aid of safety in the exterior borders of EU

- In the facilitation of trade.

1.4.1 Historical and related legislation

The customs union constitutes one from the major pylons of European Union. It provides a constant base for the economic completion and the growth in Europe for five decades.

8. SEB: EPIXEIRHSEIS& PSHFIAKH OIKONOMIA-Nees Theseis Ergasies Kalhteres Yphresies/Aprilios 2015

Since the completion of customs union in 1st July 1968, the role of customs, the methods of work and the processes that were followed, have gotten important changes in order to correspond in the increasing volume of world trade, the rapidly altered technologies, the various enterprising models and permanent transnational crime and security threat.

The first step for the electronic exchange of customs declarations throughout the EU created by the implementation of the New Computerized Transit System (NCTS) launched in 1997.

The final decision a few years later for the electronic customs raised the basic framework for the creation of a paperless environment for customs and trade, by defining the objectives, as well as the structure, the various means and the important deadlines.

Then the Commission, with the agreement of all Member States of the EU has drafted a plan that sets out the vision, goals, strategic framework and milestones for implementing e-Customs initiative, the multi-annual strategic plan (MASP).[9]

1.4.2 Multi Annual Strategic Plan (MASP)

Multi annual Strategic Plan (MASP) is a management and programming tool prepared by the European Commission in cooperation with the Member States in accordance with the Electronic Customs Decision

(European Parliament and Council No. 70/2008/EC)[10]. MASP ensures effective and consistent management

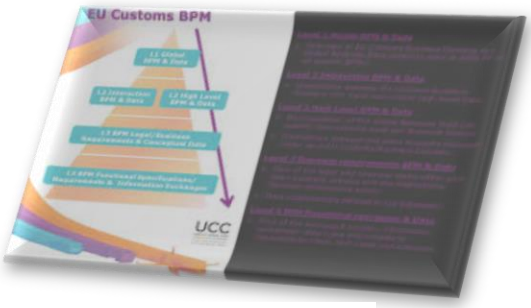

*Figure:6 MASP Main **Body***

of IT projects, by setting down both a strategic framework and milestones. Unanimous approval of Member States in the Customs Policy Group (CPG) is necessary. Approval is also given only if it is based on expert advice provided by the Electronic Customs Coordination Group (ECCG) and trade consultations in the Trade Contact Group (TCG).

The MASP is referred to as the necessary means to justify the requests of the national customs administrations on the budget and to ensure the overall governance of the legal, business and technological aspects of the new IT projects in the customs field.[11]

By setting as a precondition the achievement of these objectives, it provided the possibility of the transition to a smoother and more coordinated implementation cycle.

9. https://ec.europa.eu/taxation_customs/general-information-customs/electronic-customs_en
10. http://worldcustomsjournal.org/Archives/
11. http://www.freddypirron.be/nieuws/ELECTRONIC%20CUSTOMS

1.5 Digital systems in ports

Figure:7 smart port

Indubitably the ports constitute integral piece of shipping. Substantially it is the basic conjunctive ring in the chain of locomotions and transports. The electronic use of exchange of information, with regard to the merchandising and passenger movement contributes in the growth and in the modernization of ports. Harbours, in particular the big ones, cease to be functioning as public organisms and they are moved mostly in operating standards of enterprises. Consequently the transport of data in real time with regard to the place and the situation of various objects seated imposed the existence of informative systems. Moreover the use of these systems will contribute in a more effective planning and coordination of activities in the spaces of harbours[12].

In Greece now, the majority of ports need a number of improvements, particularly in the creation of infrastructures and in the acquisition of know-how, so that they can respond to port competition and the growing demands of maritime transport. The digitization of this sector, which is underway, aims to connect it to ports. Also, special attention should be paid to the development of modern and innovative information systems, with the aim of saving time and ensuring safer information and data traffic. It is worth noting, however, that the most modernized ports in Greece are currently in Piraeus and Thessaloniki.

Seaports operate in a fairly competitive environment characterized by the intense activity of information and communication technologies. Digital technology in the transport sector has long been a European and a general priority. Interoperability of information systems across the supply chain is the future and the most crucial factor for the essential existence and development of ports. At the earliest stages of port creation, members of the port community used communication technologies only when needed for internal procedures. The improvement of technologies in seaports continued with the application of new technologies such as RFID[13] and OCR[14] etc. Every process that takes place in a port, obviously involves the exchange of many data and information. Data and information from various stakeholders, partners and businesses must

12. http://www.safecomnet.com/airtime/vsat.html
13. https://en.wikipedia.org/wiki/Radio-frequency_identification
14. https://en.wikipedia.org/wiki/Optical_character_recognition

somehow be properly organized and managed to gain the competitive edge and increase the efficiency and performance of the port.[15]

CHAPTER 2

2. Implementation of information systems at customs

2.1 Introduction

The Customs Union was one of the first achievements of the EU and is still an important trump in the global environment of the 21st century[16]. As we reported in the previous chapter the most important evolution for the customs union of EU is the e-Customs. The main objective is the replacement of outdated customs processes with new modern electronic ones for the creation of a more safety and friendlier, as for the trade, customs environment. These new electronic services were developed in the frames of work "Concretization of Customs Electronic Services ICISnet"[17], which were placed partially in productive operation. The embodiment of the above implementations has been based on the functioning planning of European Committee for the Export Control System (ECS),that is applied by all State Members of EU.

2.2 Existing information systems at customs

2.2.1 Customs Information System "ICISnet"

ICISnet is a completed informative system the growth and application of that are able to offer, through a web portal, electronic services in various institutions which deal with the Customs. This new electronic services will be supposed to correspond:

- In the increased needs of service of commercial world, mainly into categories dealing institutions (as importers exporters, carriers, etc.)

- In the need of simplification of processes, creating a better competitive environment in the Greek economy.

Figure:8 ICISnet System

15. Plhroforiaka susthmata limenvn: Sugrones taseis kai prooptikes, Stauros St. Kolios, Stefanos-Kon/nos D. Petsios Chrisostomos D.. Stylios. (APC THE ADRIATIC HAS A WINDOW), TEI HPEIROY,
16. European Union with simple words/Customs/2014
17. https://portal.gsis.gr/portal/page/portal/ICISnet/services?adreseeID=10001980

- In the requirements for appointment and aid of electronic services as the main way of communication of Ministry with the citizens.

- In the requirements of collaboration between different sectors of Public Administration and interoperability with corresponding informative systems.

- In the increase of efficiency and improvement of processes so much in the transactions with third person what internally in the Customs Service.

- In the conformity with the new given and provisions in level EU (in the frames e-Europe and more specifically e-Government) and the guarantee of electronic exchange of data with the equivalents informative systems of rests of states-member.[18]

More specifically the use and application of ICISnet aims to:

(a) In the aid and completion of infrastructures of Public Administration in the budgetary and financing sector

(b) In the restriction of expenses of State through the radical simplification and the modernization of bureaucratic mechanisms and legislation as well as support of processes of service of citizen with ICT (Information and Communications Technology)

(c) In the service of citizens and enterprises via applications of internet as for the majority of their transactions with the Customs Service, exceeding the geographic limits of territory and via suppression of bureaucratic structures that afflict the citizens. The applications will be sold in the citizens and the enterprises in seven-day and 24-hour base

(d) In the guarantee of interoperability between the existing programs of various sectors as well as in the guarantee of scalability system as for the provided services and as for the access in services of other public institutions

2.2.2 Subsystems of ICISnet

2.2.2.1 Export Control System (ECS)

The Export Control System (ECS) has to do with the electronic exchange of information between customs and involved economic operators when completing the customs export formalities, a temporary export and re-exportation of goods from the time of submission of the Export Declaration until the final exit from the customs territory of the EU.

Export Control System was initially implemented in two phases:

18. http://www.digitalplan.gov.gr/portal/resource/YLOPOIHSH-TELWNEIAKWN-HLEKTRONIKWN-YPHRESIWN-ICISnet

Phase 1 (ECS-I) was the first part of the "Automated Export System" (AES) program, which is already in place in our country since July 2007 at ICISnet, and it has to do with the process of electronic exchange of information between the customs office of export and of the exit office. This procedure is intended to monitor the export of the goods until their final exit from the customs territory of EU.

Phase 2 of ECS-II, which has been fully implemented since 2 April 2012, covers the procedure for the export and exit of goods and the obligation for economic operators to submit data for security and protection reasons beforethe exit of the goods from the customs territory of the EU.[19]

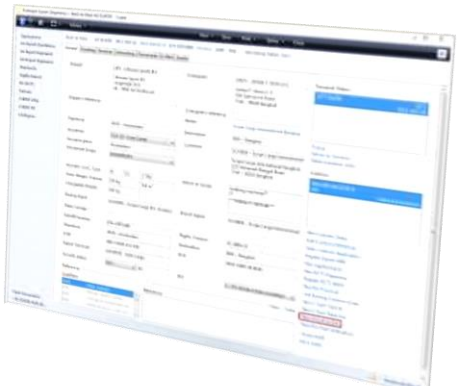

Figure: 9 ECS Arrival at Exit Message

Having completed the Export Control System (ECS) in the context of the Integrated Customs Information System (ICIS), is being replaced the whole way of customs procedures by the following substantial changes:

- Firstly, change on the way of communication between the Customs Office and the persons involved in the export formalities,

- The required declarations of the operators submitted to the Customs Office are now transmitted electronically.

- Electronic communication between customs and economic operators no longer makes live communication necessary

- Back-up procedures are in place in the case of unavailability of the computerized systems of both the customs authorities and the economic operators.

19. https://www.taxheaven.gr/laws/circular/view/id/13646

2.2.2.2 Import control system (ICS)

The import control system (ICS-I) Phase-1 is the first stage of a broader Automated Import System (AIS-Automated System Importation), covers the procedure for entry of goods into the customs territory of the community and obliges the economic operators to submit to the Customs authorities, by electronic way, Entry Summary Declaration (ENS), which includes data for safety and protection, are before the goods customs brought into the European territory of the Union. The submission of such information enables Customs authorities, using a common pan-European risk management framework. Through this, customs can carry out, before the arrival of the goods, to a risk analysis for all goods whether it landed in the first entry point or intended for next entry point and to conduct target controls for safety and protection.[20]

Figure: 10 Import control system (ICS)

The ICS – 1, can also provide the possibility for:

a) Electronic submission, management and treatment of concise elucidations of entry, included the special cases of international deviation of figurative means from the initially declared destination.

b) Electronic publication of number of report of movement (Movement Reference Number-MRN) on the concise elucidations of entry

c) Electronic conduct of danger's analysis for aims of safety and protection, treatment and exchange of results of this between the Member states of European Union.

d) Electronic submission, management and processing of Notification Arrival of transport means in the first custom of entry as well as to the next customs of entry.

20. http://www.e-forosimv.gr/details.asp?ID=7075

2.2.2.3 New Computerised Transit System (NCTS)

Customs services, in the current world environment, owe to be adapted in the needs of commercial transactions with speed and flexibility and to watch the continuous changes of enterprising environment. The New Computerised Transit System (NCTS), that is applied many years ago, works as tool for the management and the control of transit system. Moreover the NCTS is used mandatory as much for external as and for internal Union and common transit procedure (apart from cases of simplifications concerning

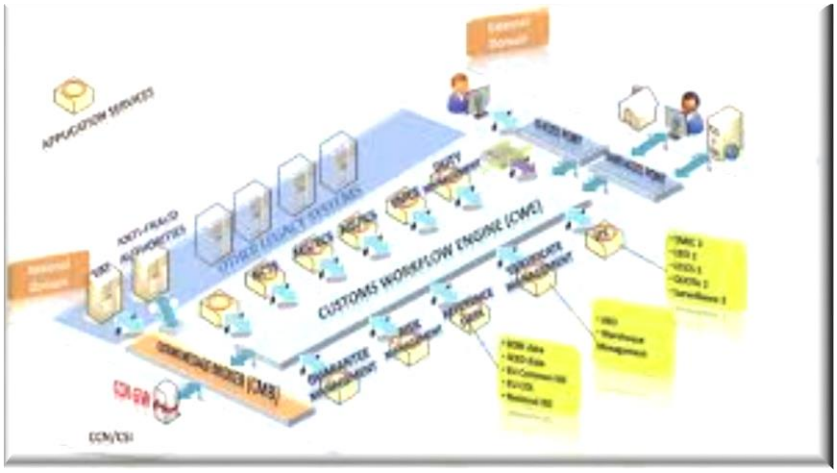

Figure: 11 THE NEW COMPUTERIZED TRANSIT SYSTEM

certain modes of transport, the business continuity procedure and for travelers who can use written declaration in certain cases). [21]

The main objectives of NCTS are the following:

- the increase of efficiency and effectiveness of transit processes
- the improvement of prevention and the detection of fraud·
- the acceleration of transactions that is carried out in the frame
- the process of transit and the guarantee of their safety.

2.2.2.4 Authorized Economic Operator (AEO)

Authorized Economic Operator (AEO) is the entity (company) who is trusted by the business partner in the international supply chain and thus, it is given the right to enjoy certain benefits, depending on the type of license that Customs Authorities has approved.[22]

21. EUROPEAN COMMISSION DIRECTORATE-GENERAL TAXATION AND CUSTOMS UNION/Brussels, 27-04-2016/ TAXUD/A2/TRA/003/2016-EN/TRANSIT MANUAL/Page 47
22. http://www.seve.gr/dieukolynsh toy emporioy-provthhsh-t/

The AEO institution, which is applied globally, it contributes as much decisively to trade facilitation as to protection of the international supply chain from the manufacturer to the final consumer, thanks to the more effective treatment of potential dangers from the Custom Authorities.

There are two types of licenses

- ✓ The AEOC (customs simplifications) enjoys the opportunity for easier inclusion into simplifications of customs legislation.
- ✓ The AEOS (safety and security) subject to fewer security and safety checks on entry and exit of goods.[23]

Figure:12 Authorized Economic Operator

It is noted that an economic operator may obtain simultaneously both types of licenses.

2.2.2.5 Economic Operator Registration and Identification (EORI)

The EORI is a unique number which is issued by the competent customs authorities of the Member States to the economic operators in the context of their business activities are involved in transactions that are governed by the customs legislation.

Once the number is granted EORI to an economic operator, that number will be used by all its transactions with the customs authorities of all States Members of the European Union as the only identification number.[24]

The use of the EORI number ensures the effective implementation of the measures which have been taken for the security and protection of the citizens of the States Members of the European Union and have been institutionalized by the Council Regulation (EC) 648/2005[25] and the Implementing Provisions of Council Regulation (EC) 1875/2006 [26] while all the economic operators can be recognized immediately from the EORI number assigned to them for use throughout the European Union Economic Operator Registration and Identification (EORI) number

Figure:13 Indetification number

23. Enimerotiko_entipo "THE PROGRAM OF AUTHORISHED ECONOMIC OPERATOR (AEO)" of the European Union Collaboration Customs – Business for the safety of the supply chain &to facilitate trade
24. GENIKH GRAMMATEIA FOROLOGIKON & TELONEIAKON UEMATON/30 JUN 2009/EGYKLIOS_EORI_FINAL.doc
25. https://eur-lex.europa.eu/eli/reg/2005/648/oj?locale=el
26. https://data.europa.eu/eli/reg/2006/1875/oj

2.2.2.6 Single Authorization for a simplified procedure (SASP).

Single Authorization for a simplified procedure (SASP) is the warrant that involved customs administrations in more than one of Member States of EU for the following procedures:

- Simplified Declaration (simplified procedure),

- Customs clearance to the Customs office designated by the place concerned.

Figure:14 Single Authorization for a simplified procedure

In order to public the single license we are engaging more than one of a State-Members. This happens because of the fact that the goods are presented, stored or used in more than one of State Members, as we have said, or because the customs declarations submitted in different State Members from the initial ones, in which the goods are located and are available for customs control.[27]

2.2.2.7 Centralized Clearance

The term "Centralized clearance" is reported as the process which makes it possible, for the various economic institutions and enterprises, to declare goods electronically and to pay the customs duties at the place where they are established beyond of the Member State where the goods were imported or exported. This presupposes that, the services of custom in the all member states should function as a single service, ensuring uniform controls and united way of confrontation from all the involved custom services in the entire the EU.

Consequently the companies through a more modern and simplified customs environment and under certain conditions, might use the process of centralized custom clearance that will provide to them the possibility of dealing with one only custom in the territory of EU. Also, it will exist easier access in the information, through online portal information for the custom, and the total of transactions with the various competent authorities will be taken place via united electronic gate.[28]

27. https://syetapa.gr/training/presentations-seminars/send/30-parousiaseis-seminaria/62-eniaia-adeia.html
28 . http://sxoli-ekteloniston.blogspot.com/2013/10/toc-o-h-z-u-pageref-toc350425798-h-5.html

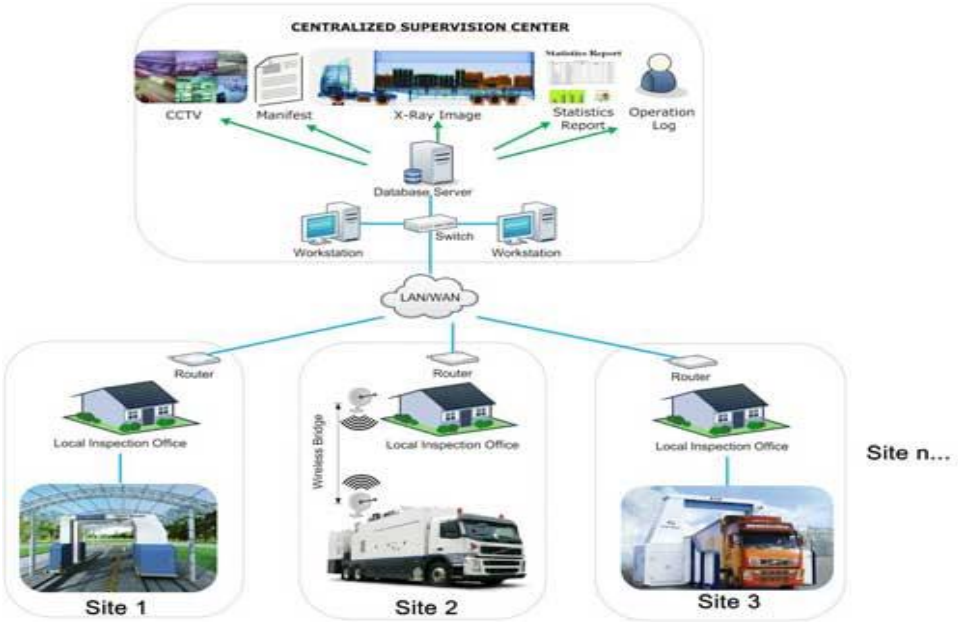

Figure: 15 Customs Inspection Centralized Supervision System

2.2.2.8 Single Electronic Access Point (SEAP)

Single Electronic Access Point (SEAP) will allow dealers to submit an electronic pre-arrival / pre-departure summary as well as full customs declarations though a single interface linking their system with the system customs of all Member States or with a central system. The data is automatically being available to the responsible competent customs authority.

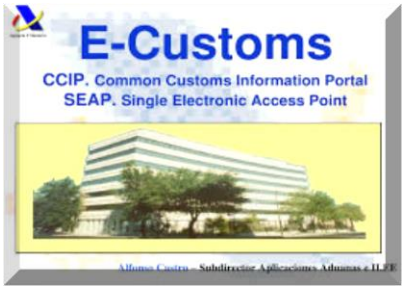

Figure: 16 Custom Inform. Portal SEAP

SEAP provides the framework environment where traders can be connected to interact with customs of (e.g. to make an apply, a document or a declaration). The elements contributing to the SEAP implementation will be performed in the context of developing new systems (SEAP is not a system by itself). The concept of SEAP should be considered in the context of every new system getting into operation. Therefore, focus is shifted from a global solution to customs systems having a new application.[29]

2.2.2.9 European Customs Information Portal (ECIP)

29. MASP Annex 2 – 2016 yearly revision (Rev. 2016) v.1.3/

Imports and exports of goods to and from the European Union are governed by a significant number of customs and regulations related to the Customs. European Commission in the context of helping exporters / importers to understand and implement customs procedures with the right way, has decided to set up an internet portal with all relevant and practical information on imports and exports to and from the countries of the European Union.

This Gateway has been developed by the European Commission in cooperation with representatives of Member States and it has been designed for entrepreneurs, such as transport and shipping companies, importers and exporters of goods, who must collaborate with the Customs in the context of their commercial activities.[30]

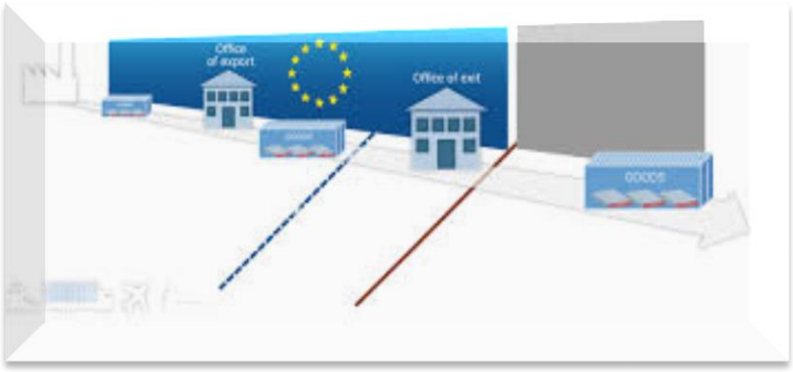

Figure: 17 European Customs Information Portal

2.2.2.10 Single Window

The development of the idea of a Single Window was aimed at trade facilitation. The single window allows to various operators and traders to submit standardized information and documents from a single entry point to meet all regulatory requirements related to imports, exports and transit. This commercial measure allows the trader or carrier to submit all the information required to determine the admissibility of the goods in a standardized form only once to the authorities that are involved in the border checks and at a single gateway. The idea of a single window transfers the responsibility to the authorities so that, through this application, they would manage and ensure that the participating authorities or organizations either have access to the information or have actually been given the information by the administrative authority. Thus the trader or carrier is no longer obliged to submit the same data to

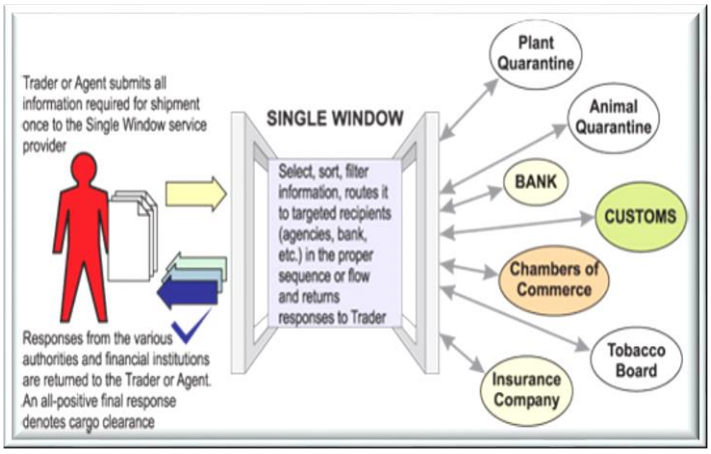

Figure:18 Example of Single Window

30. http://www.mof.gov.cy/mof/customs/customs.nsf/All/7E639E4C08C70164C2257A7D003164AD?OpenDocument

different border authorities or agencies.[31]

2.3 The impact of electronic customs services[32]

According to the study data Doing Business (2014) [33], the gradual integration of e-services in the processes of the Declaration (which has been launched by 2012) has brought about a significant reduction in the time of completing procedures for export goods by 20% between 2012-2014 (from 20 days in 2012 in 16 days in 2014) and 21% for the corresponding procedures for the import of goods in the period 2012-2014 (decrease from19 days in 2012 to 15 days in 2014). The corresponding savings in cost was estimated by the World Bank and the IMF in $38 per container[34] in the case of export and cost $130 per container in the case of imports.

Figure: 19 EUROPEAN COURT OF AUDITORS (ECA)

Furthermore at the 7th Activity Report prepared by the Task Force for Greece (June 2014)[35] stated that customs controls now are based on risk assessment, achieving with that way a significant reduction in the average number of physical checks and the documentary checks. Aggregating all of these and in conjunction with other reforms in the customs sector, including extending the opening hours of some selected customs, has been noted a remarkable reduction of time up to 50% for declarations, and reduce costs by 20% to 50% in exports.

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31. https://web.archive.org/web/20070317164545/http://www.wcoomd.org/ie/wto/Single%20Window%20Concept.pdf
32. SEB/EPIXEIRHSEIS & PSHFIAKH OIKONOMIA/Nees Thesis Ergasias Kaluteres Yphresies/2015
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CHAPTER 3

3. The role of ICTs in evolution of ports.

3.1 Introduction

The ports as nodal points of interconnection of transports between land and sea played an important role in the growth of international trade. The upgrade of their provided services through the use of ICTs and in combination with the creation of a completed system of transports, they constitute basic factors for the economic growth of a country.

Functioning to such a competitive environment as the harbour industry, it will be supposed that the responsible providers of harbour services should be corresponded immediately in the continuous requirements for modern methods of communication of data, (as the automated platforms of communication). The main target is to be improved all the harbour operations, through the interconnection of informative systems of Organizations of Ports, so that to exist precise and reliable exchange of information, in their terminal stations, between the involved institutions but they can also contribute in the enhancement of international trade safety.

3.2 ICTs applications in Ports

3.2.1 Port Community Systems (PCS)

Port Community System (PCS) is an electronic platform that connects multiple systems operated by a variety of organizations that make up a port community. It is essentially designed, developed and used to facilitate communication between services and operators operating within the port environment. The need to develop a standardized communication platform to improve systems in terms of accuracy, reliability and cost and the need to increase competitive position between ports, have been the strongest incentives to the creation of Port Community Systems .

PCS generally provide a wide range of services and key features such as[36]:

- Easy, fast and efficient exchange of information at any time
- Electronic processing of all information on the import and export of bulk and bulk containers

36. INTERNATIONAL PORT COMMUNITY SYSTEMS ASSOCIATION

- Status information and control, tracking and tracking across the supply chain
- Processing of dangerous goods as well as processing of marine and other statistics

The best profit that all the stakeholders could take, is the greater efficiency and flexibility of port processes, in particular through automation and reduction of bureaucracy.

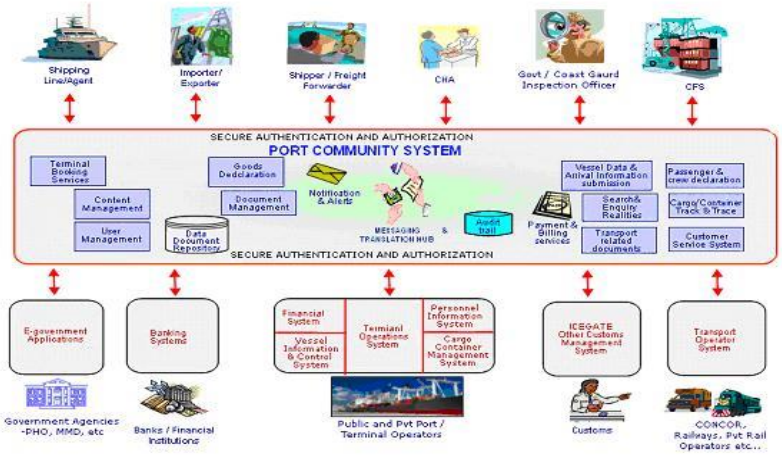

Figure: 20 PCS_ Architecture

3.2.1.1 "PHAROS" Port Community System

PHAROS Port Community System is an innovative product which is designed, developed by Europort S.A and operating in major national commercial and passenger ports. This information system contributes to α better communication between services and operators in the ports, but mostly facilitates the communication of internal services of ports with cooperating parties (companies and enterprises of various kinds, governmental organizations and services, etc.) that are not part of the port community, but they have daily transactions with it.

This project is based on two axes:

- ❖ Unified information system for communication and exchange of data and information between ports.
- ❖ A port-based information system for the improvement of services, security of documents, data, goods and human resources handling within the port's operational boundaries [37]

This system also has the potential to cooperate and act as part of a Single Portal Communication Platform, between ports. Thus, it could be a node of collecting and managing information at an interdisciplinary level. Consequently, the connection of the PHAROS Port Community System to a Single Window is considered as much feasible as practicable too.

37. http://europort.gr/gr/pcs

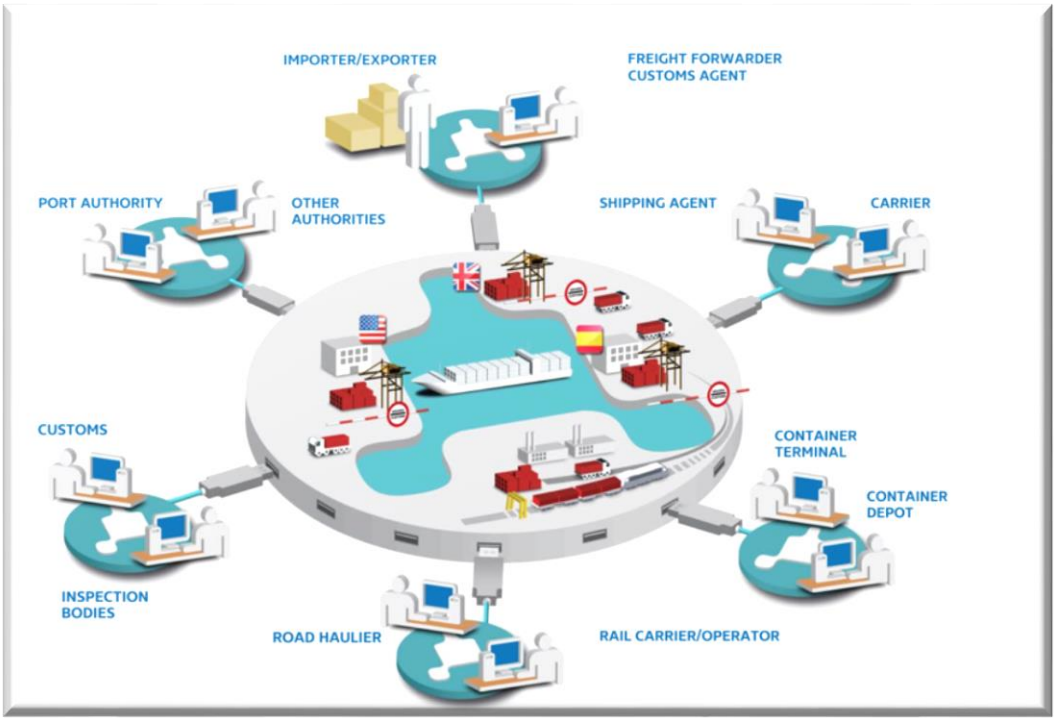

Figure: 21 Valencia port PCS

3.2.2 Terminal Operating Systems (TOS)

TOS is an operating system that could manage any function of a terminal station. This system assumes full control over the functions of an intermodal transport station (such as freight centers, container terminals, container port terminals, railway stations, etc.)[38].

A typical TOS system has three basic functions:

- Could monitor and record movements of ships, cargo, equipment, rails and trucks
- Manages gates, anchorages, mobile and fixed equipment, worker's container loaders, berths and ramps
- Communicates through interfaces with the information systems of customs, transport agents, transport companies, railways and Port Administration Organizations. [39]

38 .LOSAMEDCHEM - Meleth Skopimothtaw gia thn Anaptyxh kai Oloklhrosi enos susthmatos TPE Shediasmou Ellhmenismoy sto Limena Thessalonikhs

39. EREYNHTIKH ERGASIA HORIKOI KAI TEHNOLOGIKOI METASXHMATISMOI TVN LIMANIVN-TO PARADEIGMA TOY ROTERDAM /HANDRINOS KONSTANTINOS SEPTEMBRIOS 2009

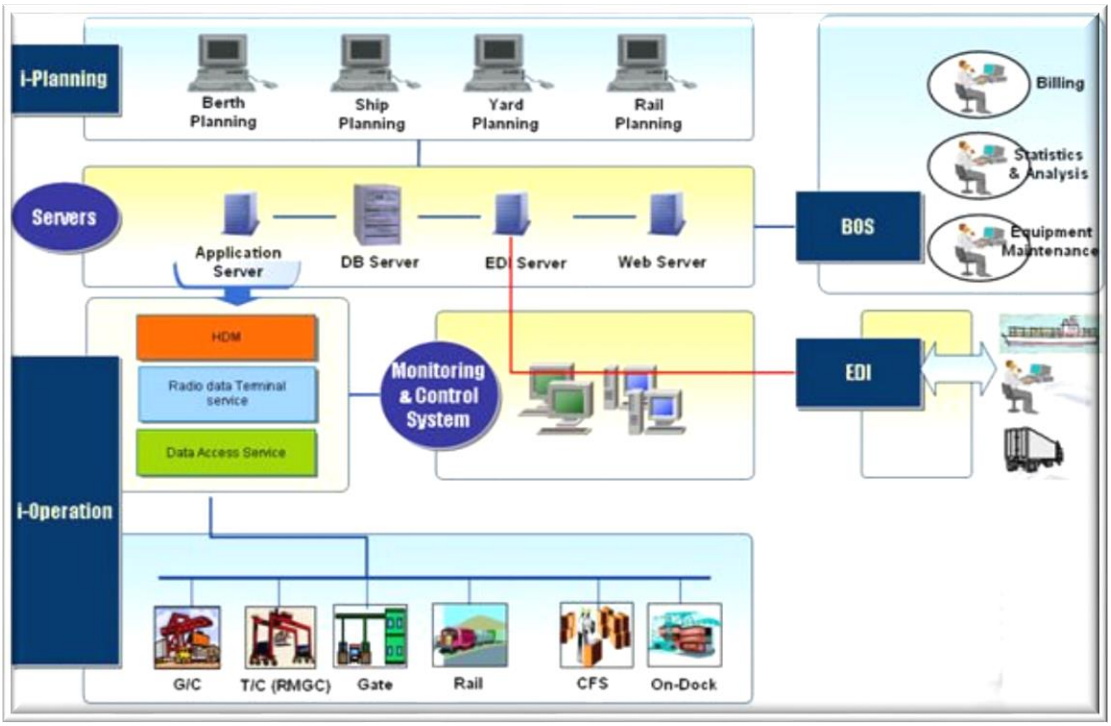

Figure:22 Port Containers Terminal

3.2.3 Global Single Window

It is a model platform for the transnational exchange of information through the Global Single Window, designed and developed in the context of project - The Adriatic Port Community (APC)[40]. This online platform allows partners of the local communities of the ports (users of the relevant PCS of each port) to access data on ships operating from one port of the Adriatic to another. The single electronic mailbox includes the features and information that each port wants to share as content with the interconnected port. Particularly in the context of the APC project, the ports of Venice (Italy), Plotse (Croatia) and Igoumenitsa (Greece) were participated during the pilot mode of Global Single Window they achieved, through the developed communication platform, innovative forms of communication and exchange of information.[41]

40. www.apcwindow.eu
41. PLHROFORIAKA SYSTHMATA LIMENON Sughrones taseis kai prooprikes Stavros St. Kolios Stefanos-Kon/nos D. Petsios Hrhsostomos D. Stulios/2013/ Parag..4.1-4.2

3.2.4 Websites

The ports can provide information, through websites about their structures, the services which be offered, the existing facilities, the access points, statistics, arrivals, departures,

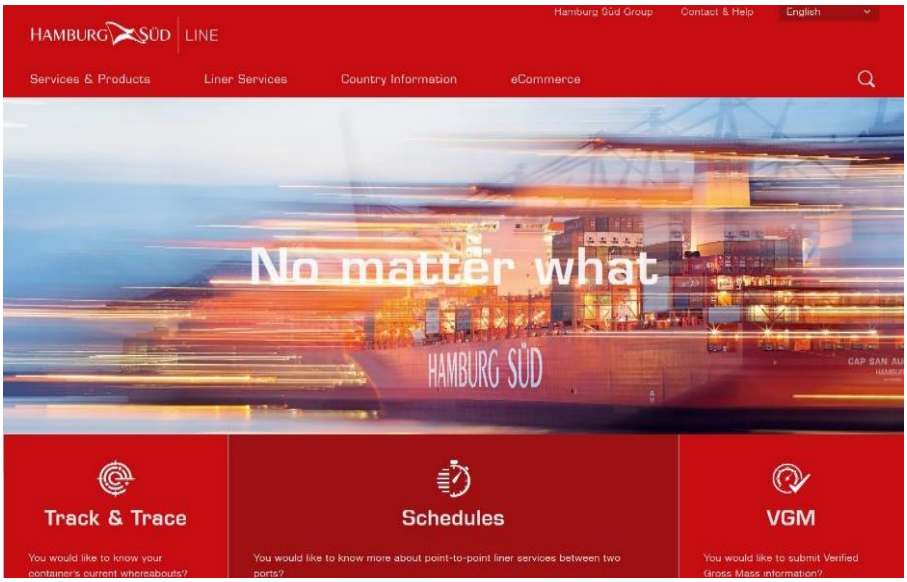

Figure: 23 website port of Hamburg

jobs. Moreover, on-line services provide the ability of payments via web. The information material is consisted by photos, various texts, brochures, maps, videos and virtual tours[42]. Finally, the combination between popular social networks and the "use of web 2.0 technologies"[43], promote the cultural events that take place on their premises.

42. NEES EFARMOSMENS PRASINES TECHNOLOGIES AXIOPOIOYN TIS DYNATOTHTES THS PARAKTIAS ZONHS H PERIPTOSH TOY LIMENA THS LINARIAS SKYROY/Par. 2.2
43. https://el.wikiversity.org/wiki_(Enterprise_2.0)

3.2.5 Vessel Tracking System (VTS)

Vessel tracking system is a ship tracking system, a collection of equipments that achieve great interconnection between ships and coastguards from different countries. Thus it could play α very important role in identifying and monitoring the vessel's position, the location and any detail that may be important about the route of the ship .

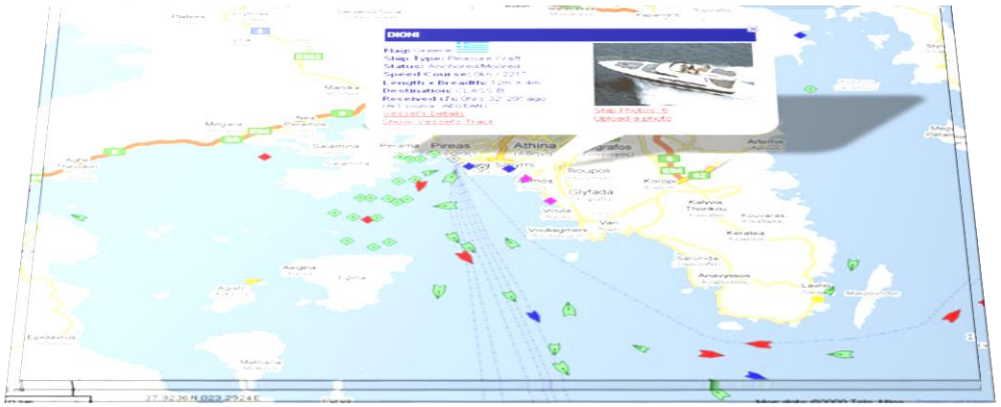

Figure: 24 The Importance of Vessel

3.2.6 Intermodal Freight Transportation[44].

It is the combined (intermodal) freight transport which involves the transport of the cargo to a combined container or vehicle, using the multiple modes (eg, rail,

Figure: 25 Intermodal Freight Transportation Market

44. https://en.wikipedia.org/wiki/Intermodal_freight_transport

ship, and truck), without any handling of its own load. This method reduces load handling and the possibility of damage or loss, improves safety and expedites the

load transfer. The reduced cost beyond the cost of the truck carrying the load is the biggest gain for intercontinental use. Even though that cost could be offset by reduced timings for road transports and by making shorter distances.

3.3 Port Management Information System P-MIS of Piraeus Port

The port of Piraeus, in the context of increasing the competitiveness and providing better and more quality services to its own users, has put in place the P-MIS system. This existing informative system in the harbour of Piraeus watches the following procedures:

- The station of containers
- The deposits of general charge
- The freely area
- The station of cars
- The management of instruments and equipment
- The pricing
- The payroll
- The accounts department

The applications that used are:

- SPARCS: For graphic management of Containers and charge and discharge of boats in real time.

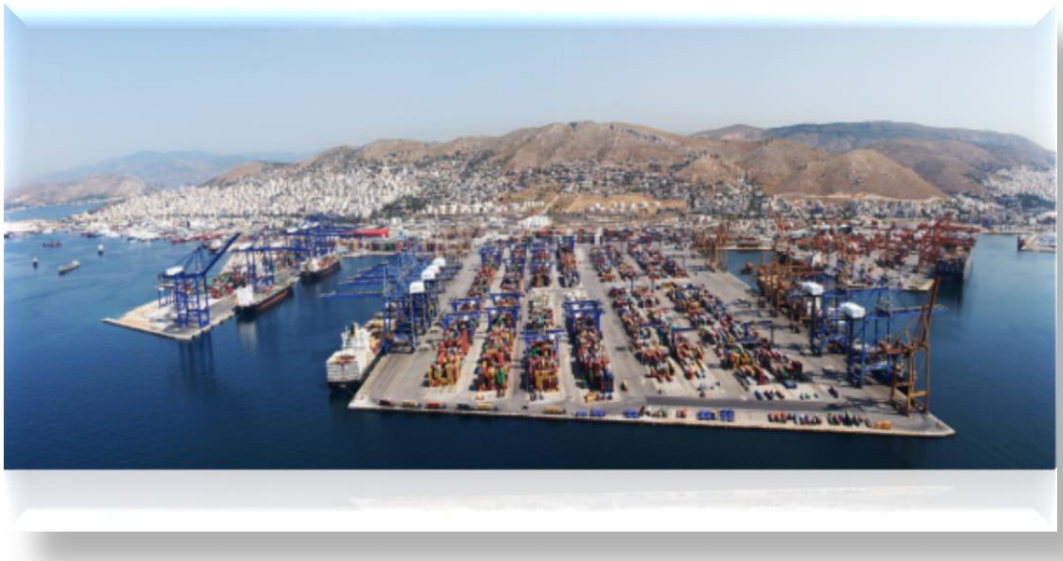

Figure 26: Pireus container terminal

- EXPRESS: Computer system of management Container Terminal, deposits and pricing.
- PLAMS: For the management and follow-up of maintainance of instruments and equipment[45].

In conclusion this system contributes in the better management of harbour. Another point which has to do with the use of ground, on one side was increased the density of stocking of goods, but on the other side is not decreased the total productivity while the time of waiting of goods. in the space of port has reduced enough.

3.4 Information Technologies of Singapore Port

Singapore, the busiest seaport of the world and the world's largest container port, has invested mostly to information technology (IT), including equipment, software, and personnel's training. Two major IT projects, CITOS (Computer Integrated Terminal Operations Systems) and CIMOS (Computer Integrated Marine Operations System)

Figure 27: Singapore-as-a-hub-port

use command-and-control computers to direct every operation in the container terminal and in the port. The implementation of IT to the port operations in Singapore has shown real effective gains in cost reduction and better customer service[46].

45. Dhmhtrhs, Thanashs Koinhs Plheoforiako Systhma Limenos Peiraeus Port Management Information System P-MIS.(Dieuthhnsh anaptyxhs kai Mhchanografhshs O.L.P. A.E)
46. https://www.sciencedirect.com/science/article/abs/pii/0305750X92900919

3.5 Information System “Port Infolink” of Rotterdam Port

“Port Infolink” is an information system that connects businesses where operate in the largest harbor of Europe and one of the largest in the world, the port of Rotterdam. The system is a module between ICT services, a platform with all port facilities and a central database which stores all the information exchanged through the information system.

Figure 28 Port of Rotterdam Authority launches new Pronto application

The way of operation that concerns processes of interaction though messages or between systems or people, is executed with normality that is ensured by the common platform while the central database allows the re-use of the recorded information. Companies are charged with a small financial contribution due to the use of the platform but other services are provided free of charge because they are funded by the Port Administration[47].

3.6 New green technologies

3.6.1 Intelligent Transport Systems (ITS) [48]

Intelligent Transport Systems (ITS) constitute a dynamic sector with big developmental dimensions,that combine the technologies of information technology and communications (ICTs), providing high value for the users of transport means and making the transports more effective

47. EREYNHTIKH ERGASIA HORIKOI KAI TEHNOLOGIKOI METASXHMATISMOI TVN LIMANIVN-TO PARADEIGMA TOY ROTERDAM /HANDRINOS KONSTANTINOS SEPTEMBRIOS 2009
48. http://www.yme.gr/index.php?tid=135

and friendly to the environment. While the modern transport systems raise important requirements about the safety, economy and the effectiveness, the ITS aim to the benefit of innovative services which related with the various ways of transport, such as the imposition of rules and the management of traffic, while at the same they allow in the users (companies, administrators or citizens) to have better information and making safety and more intelligent use of transport networks and available resources

3.6.2 Smart Ports

Smart ports are α system of supporting services that based on modern information technology. The characteristics of them, are to provide a variety of port information services with the aim of collecting, processing, releasing, exchanging, analyzing and using relevant information. In conclusion, smart ports are new port generations, which have a new smart port infrastructure and integrated and intelligent management and service.[49]

Figure 29 Artist's Impression of Green Port Hull

3.6.3 Internet of things (IoT)

Internet of Things (IoT), as defined by IEEE[50], is a network of objects that includes sensors and embedded systems that are connected to the Internet and allow physical objects to collect and exchange data.

IoT technology is the basis for the development of Intelligent Ports. In order to achieve effective data exchange and stability of port services, intelligent ports should be closely connected with IoT technology.[51]

49. https://www.researchgate.net/publication/261343481_Intelligent_ports_based_on_Internet_of_Things
50. https://ieeexplore.ieee.org/document/8278808
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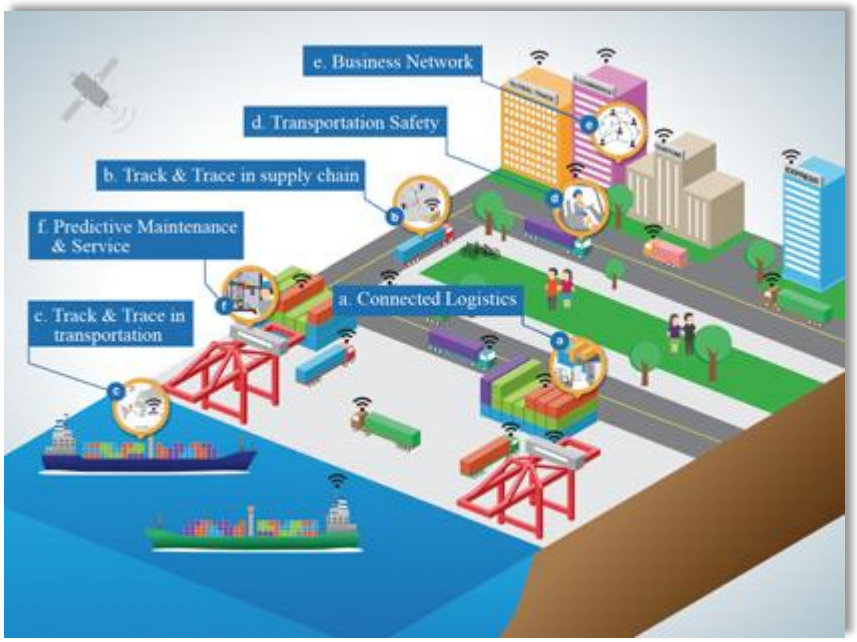

Figure 30: IoT-Enabled Digital Transformation for Shipping Ports

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GIES_AXIOPOIOUN_TIS_DYNATOTETES_TES_PARAKTIAS_ZONES_E_PERIPTOSE_TOU_LIMENA_TES_LINARIAS_SKYROU

CHAPTER 4

4. The configuration of National strategic planning for the evolution of Greek ports[52]

Greek ports can constitute the motive force for the development of country, as much in level of local economies as in the national one.

Particularly in conditions of economic crisis and recession, the exploitation of possibilities of Greek ports is decisive factor for the restarting of developmental process and the reinforcement of employment.

The Greek ports exploiting the geographic position of Greece they should:

- increase their participation in the international transit trade and in particular this which is trafficked in Eastern Mediterranean,
- provide high quality services in all levels in competitive prices through applications of new technologies (ICTS),
- have flexible and effective administrative operation with simplification of processes and exemption from time-consuming bureaucratic processes, adopting modern methods of administration and management.
- they attract private capital and know-how.

The responsible Marine Ministry drawing a National Port Policy pursues to form a National Strategic schedule which aims at the completion and growth of modern port system included in a completed transport system for the improvement of competitiveness of economic growth of country.

4.1 This strategy is moved along two pillars:

4.1.1 The first-pillar strategy

The first pillar moves under the structural changes to be implemented to modernize the administration and operation of the port system of the country and internal shipping network. In this environment, the challenges presented are direct and daily and affect the lives and the large part of Greek territory and future significant number of Greek citizens living in the Greek islands.

52. **EUNIKH STRATHGIKH LIMENVN 2013-2018 /Ypourgeio Nautilias & Aigaiou/DEKEMBRIOS 2012/PAG. 76**

Moreover, the importance of effective enhancement of the "internal front" is obvious for rea-

Figure: 31 Port of Mykonos-Port of Hydra

sons of national status and territorial integrity reasons. The economic, social and cultural survival of Greek citizens of island territory greatly depends on the proper and efficient operation of the internal maritime passenger transport and freight network.

4.1.2 The second-pillar strategy

The Second pillar is moving to improve the competitiveness of ports and the upgrading of their role in the international passenger and freight transport system, taking advantage of the geographical position of Greece. Specifically taking advantage of the

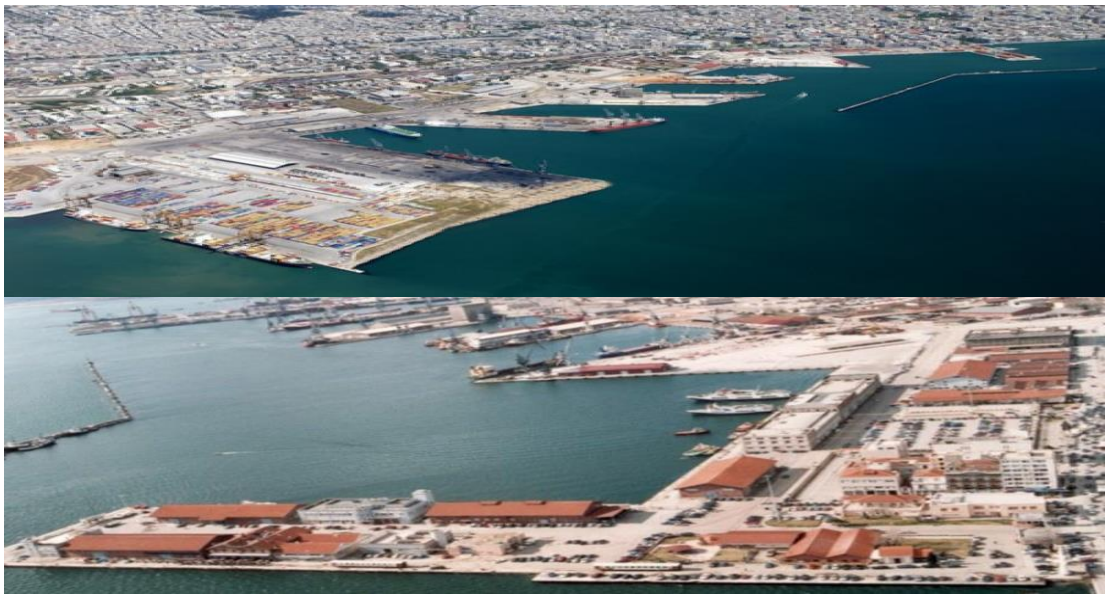

Figure:32 Port of Piraeus-Port of THessaloniki

unique characteristics of the Greek ports, it could enhance their participation in theglobal maritime passenger and freight transport system. .

Greece is already the gateway to the countries of the Balkan Peninsula, and this operation must also be strengthened by the development of intermodal transport networks**.**

CHAPTER 5

5. Conclusions-Interventions

In summary it becomes perceptible the effort for the creation of innovative technologies with profit the economic and social growth as much in European as in national level. The international tendencies that are presented in the global trade for the adoption flexible and more reliable processes create a particularly competitive environment or in the sector of enterprises or in the harbour sector. Therefore the road of growth of such technologies is the only way inside that they overlap the needs and the continuous requirements for better communication and more precise and safety exchange of information.

In Chapter 2 as we were reported extensively in the electronic customs, the main objective was and it is the complete passage from an environment of paper in an electronic environment. Helper in this development is the European Committee, which with Multi Annual Strategic Plan (MASP) as tool of management and programming seeks the upgrade of services and processes of electronic custom so that is followed the same custom policy for the all member-states through the interconnectivity of their informative systems. Of course it should be taken into account the different needs and requirements that govern the status of each country separately. Consequently in order to exist a single digital communication platform and exchanging information will be supposed these new technologies should incorporate functions that adapted to the needs of each member states and the constant requirements for trade facilitation. This is why the MASP is revised in annual base so that it includes any shortcomings or new requirements that being put forward by all countries of EU.

The Greek electronic custom via the application of completed informative system ICISnet and her sub systems, provide electronic services with result the simplification of the procedures and generally the better collaboration between the involved public and private institutions. Hence the companies do not dispatch the elements once a month stored in some digital means, in order to be processed, in secondary time, by the responsible custom authorities, but they enter in the corresponding informative system and inform it on real time.

Now as it concerns the development of ports, the incorporation of new technologies that is already applied to international ports and in general, to ports with major importance they have accelerates the rhythms of growth. Consequently the use of ICTs has upgraded their role in the international trade and they have created an extremely competitive environment with enormous profits for the development of national economies and for the users of ports too. In addition,

strategic planning for port development at national, European and international level is moved in this direction.

Of course, because modern requirements are constantly demanding for better and safer services, ports need to be constantly evolving and upgrading their provide services by investing in new technologies that, combined with the use of ICTs, could have the best possible result.

Figure 33: "INFORMATION AND COMMUNICATION, TECHNOLOGY (ICT)"

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